THE

COMPUTER TUTOR: ATARI®

HOME COMPUTER EDITION

Learning Activities

for Homes and Schools

For the ATARI® 400/800,™

600XL™, 800XL™, 1200XL™

1400XL™ and 1450XLD™

Home Computers and the

ATARI VCS 2600™/5200™

Computer Keyboards

By Gary W. Orwig and William S. Hodges

Little, Brown Microcomputer Bookshelf

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FOREWORD

Here is a book for parents who are growing with their children, who care about their learning, and who like to be involved with them in new and exciting ways. It is a book for parents who would like to play with their children while their children play with computers, or play with their computers while their children play with those same computers. And it is a book for teachers who want computer-assisted instructional exercise material for the classroom microcomputer. In short, here is a book for almost anyone who is interested in children, in education, in computers.

Americans have always been interested in children and in education. They've also been interested in applying technology in education and play, as in other areas of their lives. When necessary, they've been prepared to study at home, no matter what feeble technology they had at their disposal. This Great American Tradition of self-education is exemplified by young Abraham Lincoln studying by firelight, writing in charcoal on a shovel.

Today, of course, learning is more complex, so it is easy to leave the schools in charge of the whole job. But the home computer revolution has given today's Honest Abe a new kind of shovel. This new "shovel" isn't quite as easy to use as the old kind—and that's where Orwig and Hodges come in. They've assembled a book of practical computer-assisted instruction (CAI) for real people with real ideas about what they want to learn, or want their children or students to learn.

More sophisticated programs for computer-assisted instruction certainly exist. But the beauty of the shovel wasn't its sophistication, but its accessibility. *Learners* want to be able to understand CAI programs when they decide to get inside and make a few custom changes.

Chesterfield once said, "There are three classes of people in the world. The first learn from their own experience—these are wise; the second learn from the experience of others—these are happy; the third neither learn from their own experience nor the experience of others—these are fools." The person who programs a home computer for self-education is both wise and happy when using a book like *The Computer Tutor*. There is the very direct learning obtained from interacting with the programs, but perhaps even more important is the *learning about learning* that comes from getting behind the scenes through sharing the authors' experience.

If you already own a computer, you know what a powerful teacher it can be, but perhaps you don't suspect its full power or know how to harness it to your own learning

goals. If so, you're likely to be receptive to Orwig and Hodges. You'll undoubtedly be able to think of hundreds of lessons which can be created along the lines of one of this book's model programs.

If you don't already own a computer, I can think of no better reason for investing in one than as a self-education device. And I can think of no better place to start than with one of the programs in this book. I don't promise you'll become The Great Emancipator, or even just an ordinary President of the United States. But I will promise that you'll be taking part in The Great American Tradition—and it's easier than splitting rails!

Gerald M. Weinberg

Series Editor

PREFACE

Thomas Jefferson, a member of the original group of architects of the United States government and third U.S. President, once stated that in order to have an informative, cohesive society, the masses must be educated. In his day and time Jefferson was speaking about the 3 R's of reading, writing, and arithmetic. He never dreamed that a 4th R would develop in the future that would be just as important to the continued evolution of an informed society as were the original basic disciplines of education.

It has been predicted that this 4th R in education will be (or already is) the need for individuals to develop fundamental computer literacy. Digital computers and computer programming have been in existence for decades; however, with the appearance of microcomputers in the 1970's, the importance of computer literacy was dramatically magnified. Educators could no longer ignore the computer as an important tool, especially when they discovered that many of their students had microcomputers in their own homes. It has been predicted that the 1980's will be the beginning of computer education for the entire world on a mass marketing basis, and that anyone not computer literate will be as lost in society as those who neither read nor write today.

Educators who have worked with microcomputers in programmed instruction (PI) classrooms unanimously agree that microcomputers motivate students (especially in remedial training) more than any other single instructional tool. Computer-assisted instruction (CAI) teaches students logical thinking, allows for individualized review and practice (drill and practice), provides immediate feedback on performance, and in many cases gives a student a chance to demonstrate his or her creativity. Automatic interaction and instant feedback gives CAI a tremendous advantage over other audio/visual classroom techniques.

Although some critics charge that CAI is "mechanical" and impersonal, this rarely is the case. In fact, a student in need of remedial instruction can often obtain more personalized, "humanistic" attention from well designed CAI programs than he or she can get from a classroom with 34 other students in it. Most instructors using CAI feel that they become consultants instead of lecturers. These teachers are not hardware or software experts, but they do know enough to instruct students on how to use microcomputers and peripherals such as cassette tapes, disks, and printers.

Complete teacher acceptance and training in CAI is essential for the predicted computer literacy evolution of the 1980's to take place. The lack of high-quality, portable CAI courseware has slowed the computer literacy movement; to help fill this courseware

void we have created a book intended to make CAI programs easily accessible to educators worldwide.

The Computer Tutor was written to be both educational and entertaining to teachers, parents, and students alike. Our courseware and the explanation of programming techniques cover a variety of subjects such as mathematics, science, social studies, etc. The courseware also includes a discussion on the insertion of graphic subroutines into the program listings. At the same time we have tried to maintain a tone designed to exploit the excitement and challenge of CAI.

We realize that without computer hardware our courseware cannot be utilized. With increasing distribution of low-cost microcomputers into educational systems, more hardware is becoming available to educators. However, greater efforts must be directed toward establishing computer literacy in the minds of taxpayers (parents) and local, state, and federal government officials. Computer awareness groups can be formed to educate taxpayers and school board officials of the educational and practical usefulness of CAI in their school systems. School seminars can also be given at PTA (Parent/Teacher Association) meetings to inform the public of the need for computer hardware and software as teaching tools for students.

CAI will never replace teachers as human factors in classrooms. However, it will give educators an excellent opportunity to enhance their teaching techniques. For example, it might give instructors time away from lecture and other "mass education" delivery methods in order to devote more personal time to both remedial and gifted students in the classroom.

We hope *The Computer Tutor* will provide a vehicle to assist the educator in CAI and to act as a stimulus toward a better understanding of computers and computer literacy by the general public. The task will not be an easy one and, like most worthwhile things, it will take time. However, with the help of teachers, parents, officials, and students working together, we believe that computer literacy on the part of the public will eventually be achieved. And we suspect that Thomas Jefferson would be very pleased.

Gary W. Orwig

William S. Hodges

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THE COMPUTER TUTOR

INTRODUCTION

Computer-assisted instruction (CAI) can be traced back to a machine, invented in 1924 by Dr. Sidney Pressey, that was used to grade multiple-choice examinations. CAI's real roots are, however, associated with B. F. Skinner, a behavioral psychologist who, in 1954, published an article in the *Harvard Education Review* entitled "The Science of Learning and the Art of Teaching." Programmed instruction (PI) in education was made more prominent as a direct result of this article. Such terms as linear programming, drill and practice, branching, and simulation also became a part of an educator's vocabulary. CAI is nothing more than programmed instruction (PI) using computer hardware and software to carry out the teaching techniques. The main value of CAI is that it is an effective teaching tool for *individual* instruction rather than for a *group* lecturing method.

The Computer Tutor: ATARI® Home Computer Edition is a guide for developing CAI in elementary and secondary schools as well as in the home environment. Twenty-five computer programs teaching mathematics, science, vocabulary, and social studies by use of *linear, branching,* and *simulation* programmed instruction (PI) techniques have been included in the book. All program listings and their sample runs were written and operated on an ATARI 400/800 Home Computer using 16K Microsoft® BASIC and ATARI BASIC computer programming languages. All programs will run on the ATARI 400/800™, 600XL™, 800XL™, 1200XL™, 1400XL™, and 1450XLD™ Home Computers and on the ATARI VCS 2600™/5200™ Computer Keyboard.

Graphic and sound subroutines for pictorial displays and sound effects are included in Appendix A to be used as suggested guides for adding graphics and sound to the programs.

Programming techniques and suggestions for modifying and/or personalizing the programs included in the text are mentioned after each program description. A *Glossary* covering some computer hardware and software terms, CAI terms, and graphic definitions is included in Appendix B. The Glossary should assist the reader or instructor in understanding some of the terms used in the explanations of the programs and elsewhere in the book.

All the program listings are easily entered into the computer's memory by following the programming instructions described in each individual computer hardware owner's manual.

PROGRAM DISCUSSION

The following programs have been written in both the original ATARI BASIC and the newer ATARI Microsoft BASIC. Each of these BASIC dialects has some good points and some bad points. The original BASIC is in a plug-in cartridge and can be used with a minimal ATARI Home Computer set-up. Unfortunately, the original BASIC has very primitive word handling routines, which make certain parts of these programs difficult to follow. The newer ATARI Microsoft BASIC has far more sophistication, thus making for easier program writing. It is currently available, however, only on a floppy disk. Because this version must be loaded into memory, the computer must have 48 thousand bytes of program memory and a disk drive. There are rumors that this "extended" BASIC will soon be available in a cartridge, though, so check with your local store.

The following programs have been written so that they will perform almost identically using either BASIC language. While this gives you a chance to compare routines in each dialect, it does not allow for the most efficient use of the powerful Microsoft version. The individual program notes will point out areas where modifications might be made in order to encourage you to learn to use some of the new commands in the Microsoft BASIC.

The programs presented here contain the following components:

A. Program Description

B. Program Notes

C. Program Listings (for ATARI BASIC and Microsoft BASIC)

D. Sample Run

It should be noted that the sample runs have been condensed (many blank lines have been removed) to save space. In many cases, the programs are very active, with information constantly scrolling on and off the video screen. One of the shorter programs, with all scrolling lines left in, produced over 20 feet of print-out on a sample run! In addition, some of the sample runs, such as the Spelling Quiz, don't seem to make a lot of sense. You must keep in mind that while the print-out is permanent, the actual video image can come and go very rapidly.

Finally, you will notice that the program listings follow very definite patterns. Whenever possible, the same line numbers perform the same functions. It is wise to develop this habit because you will find that subroutines are easy to memorize if they are repeated frequently. For variety, though, the same function has sometimes been performed several different ways. This was not an accident—it is intended to allow you to select your favorite method. And by all means, don't be satisfied with what is in this book! It is intended to get you started, but you should dig in and "customize" these programs to suit your own needs.

Happy CAI!

Hello! My name is Arthur. I have been selected as your guide to lead you through an exciting and rewarding adventure! Follow me as I demonstrate to you how fun and easy it is to learn mathematical and verbal skills with the use of personal computers.

LINEAR PROGRAMS

Linear programming is the most common form of programmed instruction (PI). It is presented in a logical (fixed) sequence of small steps or frames. When used with a computer, linear programming becomes a form of *drill-and-practice* computer-assisted instruction (CAI). The fifteen program listings and sample runs were chosen as a representative sample of linear programs that provide instruction in basic mathematics, vocabulary, science, memory enhancement, and social studies.

Capitals of Nations

PROGRAM DESCRIPTION

A geography lesson is presented in this program. For this "trip around the world," the computer asks you a series of multiple-choice questions, asking you either to select the correct capital of a nation or the correct nation given the capital. The computer will ask you the questions you missed at a later time during the test. You must answer all of the questions correctly in order to complete the program.

PROGRAM NOTES

1. This program may need occasional updating. Nations and capitals do have a tendency to change!

2. By changing the data base you could use this program to teach any sets of matched pairs like English/French, event/date, author/title, etc.

PROGRAM LISTING: BASIC

```
100 REM CAPITALS OF NATIONS BY GARY ORWIG
500 REM PUT MESSAGE ON SCREEN
510 PRINT
520 PRINT "ONE MOMENT PLEASE."
1000 REM INITIALIZATION
1010 TL=114
1020 TL=TL+1
1030 DIM N(4),CA$(TL*20),NA$(TL*20)
1040 DIM CAI$(20),NAI$(20),S$(20),SA$(20)
```

```
1050 FOR I=1 TO TL
1060 CA$(I*20-19,I*20)="                    "
1070 NEXT I
1080 NA$=CA$
1090 CAI$="                         "
1100 NAI$=CAI$:S$=CAI$:SA$=CAI$
1110 REM READ IN NATION : CAPITAL ARRAYS
1120 LN=1
1130 FOR I=1 TO TL
1140 READ NAI$,CAI$
1150 CA$(LN)=CAI$
1160 NA$(LN)=NAI$
1170 LN=LN+20
1180 NEXT I
1190 G=0
1200 TL=TL-1
1210 BL=TL
1220 N=0
1230 REM USE FULL SCREEN
1240 POKE 82,0
1250 PRINT
2000 REM INTRODUCTION
2010 L=12
2020 GOSUB 18000
2030 PRINT "          NATIONS AND CAPITALS"
2040 GOSUB 18000
2050 DE=150
2060 GOSUB 19000
2070 GOSUB 18000
2080 PRINT "THIS IS A PROGRAM WHICH WILL TEST YOUR"
2090 PRINT "KNOWLEDGE OF NATIONS AND THEIR"
2100 PRINT "CAPITALS."
2110 PRINT
2120 PRINT "YOU WILL BE GIVEN MULTIPLE CHOICE"
2130 PRINT "QUESTIONS WHICH HAVE FOUR ANSWERS EACH."
2140 PRINT
2150 PRINT "YOU SHOULD ANSWER WITH A '1,' '2,'"
2160 PRINT "'3,' OR '4.'"
2170 PRINT
2180 PRINT "TO STOP AT ANY TIME, TYPE IN A '0'"
2190 PRINT "FOR AN ANSWER."
2200 PRINT
2210 PRINT "YOU HAVE A CHOICE:"
2220 PRINT "    1. BE GIVEN THE NATION"
2230 PRINT "       AND ANSWER WITH THE CAPITAL"
2240 PRINT
2250 PRINT "    2. BE GIVEN THE CAPITAL"
2260 PRINT "       AND ANSWER WITH THE NATION"
2270 PRINT
2280 PRINT "PICK '1' OR '2'"
2290 INPUT SE
2300 IF SE<1 OR SE>2 THEN 2280
2310 L=18
2320 GOSUB 18000
2330 L=9
4000 REM MAIN PROGRAM
4010 GOSUB 10000
4020 REM C IS POSITION OF CORRECT ANSWER
```

```
4030 C=INT(RND(0)*4)+1
4040 REM PICK THREE NUMBERS
4050 FOR I=1 TO 3
4060 N(I)=INT(RND(0)*TL)+1
4070 NEXT I
4080 N(4)=N(C)
4090 N(C)=R
4100 REM MAKE CERTAIN ALL FOUR NUMBERS DIFFER
4110 IF N(1)=N(2) OR N(1)=N(3) OR N(1)=N(4) THEN 4050
4120 IF N(2)=N(3) OR N(2)=N(4) OR N(3)=N(4) THEN 4050
4130 IF SE=2 THEN 4250
4140 REM PRINT CAPITALS
4150 GOSUB 18000
4160 PRINT "1.";CA$(N(1)*20-19,N(1)*20)
4170 PRINT "2.";CA$(N(2)*20-19,N(2)*20)
4180 PRINT "3.";CA$(N(3)*20-19,N(3)*20)
4190 PRINT "4.";CA$(N(4)*20-19,N(4)*20)
4200 GOSUB 18000
4210 PRINT "THE CAPITAL OF "
4220 PRINT NA$(R*20-19,R*20)
4230 PRINT "IS:"
4240 GOTO 4340
4250 REM PRINT NATIONS
4260 GOSUB 18000
4270 PRINT "1.";NA$(N(1)*20-19,N(1)*20)
4280 PRINT "2.";NA$(N(2)*20-19,N(2)*20)
4290 PRINT "3.";NA$(N(3)*20-19,N(3)*20)
4300 PRINT "4.";NA$(N(4)*20-19,N(4)*20)
4310 GOSUB 18000
4320 PRINT CA$(R*20-19,R*20)
4330 PRINT "IS THE CAPITAL OF ";
4340 INPUT SA
4350 IF SA<1 OR SA>4 THEN 4680
4360 IF SA=C THEN 4500
4370 PRINT
4380 PRINT "WRONG!"
4390 IF SE=2 THEN GOTO 4450
4400 PRINT
4410 PRINT "THE CAPITAL OF "
4420 PRINT NA$(R*20-19,R*20)
4430 PRINT " IS ";CA$(R*20-19,R*20)
4440 GOTO 4630
4450 PRINT
4460 PRINT CA$(R*20-19,R*20)
4470 PRINT " IS THE CAPITAL OF "
4480 PRINT NA$(R*20-19,R*20)
4490 GOTO 4630
4500 REM
4510 N=N+1
4520 PRINT
4530 PRINT "RIGHT! YOU HAVE ";N;" CORRECT!"
4540 REM REMOVE CORRECT ANSWER FROM LIST
4550 S$=CA$(R*20-19,R*20)
4560 CA$(R*20-19,R*20)=CA$(BL*20-19,BL*20)
4570 CA$(BL*20-19,BL*20)=S$
4580 S$=NA$(R*20-19,R*20)
4590 NA$(R*20-19,R*20)=NA$(BL*20-19,BL*20)
4600 NA$(BL*20-19,BL*20)=S$
```

```
4610 BL=BL-1
4620 IF BL=0 THEN GOTO 4740
4630 DE=150
4640 GOSUB 19000
4650 G=G+1
4660 GOTO 4010
4670 REM STOP?
4680 PRINT "DO YOU WANT TO STOP";
4690 INPUT SA$
4700 IF SA$="Y" OR SA$="YES" THEN 4750
4710 PRINT "WHAT WAS YOUR ANSWER"
4720 PRINT "TO THE LAST PROBLEM";
4730 GOTO 4340
4740 G=G+1
4750 PRINT "YOU GOT ";N;" RIGHT IN ";G;" GUESSES"
4760 PRINT
4770 PRINT "WOULD YOU LIKE TO TRY AGAIN";
4780 INPUT SA$
4790 PRINT
4800 IF SA$="Y" OR SA$="YES" THEN GOTO 1190
4810 END
10000 REM RANDOMIZATION
10010 R=INT(RND(0)*BL)+1
10020 RETURN
18000 REM SCROLLING
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM DELAY
19010 FOR I=1 TO DE
19020 NEXT I
19030 RETURN
21000 REM DATA
21010 DATA AFGHANISTAN,KABUL,ALBANIA,TIRANA,ALGERIA,ALGIERS
21020 DATA ANGOLA,LUANDA,ARGENTINA,BUENOS AIRES,AUSTRALIA,CA
NBERRA
21030 DATA AUSTRIA,VIENNA,THE BAHAMAS,NASSAU,BANGLADESH,DACC
A
21040 DATA BARBADOS,BRIDGETOWN,BELGIUM,BRUSSELS,BOLIVIA,SUCR
E
21050 DATA BOTSWANA,GABORONE,BRAZIL,BRASILIA,BULGARIA,SOFIA
21060 DATA BURMA,RANGOON,CAMBODIA,PHNOM PENH,CANADA,OTTAWA
21070 DATA CHILE,SANTIAGO,PEOPLE'S REP. OF CHINA,PEKING
21080 DATA REPUBLIC OF CHINA,TAIPEI,COLOMBIA,BOGOTA,COSTA RI
CA,SAN JOSE
21090 DATA CUBA,HAVANA,CYPRUS,NICOSIA,CZECHOSLOVAKIA,PRAGUE
21100 DATA DENMARK,COPENHAGEN,DOMINICAN REPUBLIC,SANTO DOMIN
GO
21110 DATA ECUADOR,QUITO,EGYPT,CAIRO,EL SALVADOR,SAN SALVADO
R
21120 DATA ETHIOPIA,ADDIS ABABA,FIJI,SUVA,FINLAND,HELSINKI
21130 DATA FRANCE,PARIS,GERMANY,BERLIN,GHANA,ACCRA,GREECE,AT
HENS
21140 DATA GUATEMALA,GUATEMALA CITY,HAITI,PORT-AU-PRINCE,HON
DURAS,TEGUCIGALPA
21150 DATA HUNGARY,BUDAPEST,ICELAND,REYKJAVIK,INDIA,NEW DELH
I
```

```
21160 DATA INDONESIA,JAKARTA,IRAN,TEHRAN,IRAQ,BAGHDAD
21170 DATA IRELAND,DUBLIN,ISRAEL,JERUSALEM,ITALY,ROME
21180 DATA JAMAICA,KINGSTON,JAPAN,TOKYO,JORDON,AMMAN,KENYA,N
AIROBI
21190 DATA SOUTH KOREA,SEOUL,KUWAIT,KUWAIT CITY,LAOS,VIENTIA
NE
21200 DATA LEBANON,BEIRUT,LIBERIA,MONROVIA,LIBYA,TRIPOLI
21210 DATA LIECHTENSTEIN,VADUZ,MADAGASCAR,TANANARIVE,MALAYSI
A,KUALA LUMPUR
21220 DATA MALI,BAMAKO,MALTA,VALETTA,MAURITANIA,NOUAKCHOTT
21230 DATA MEXICO,MEXICO CITY,MONGOLIA,ULAN BATOR,MOROCCO,RA
BAT
21240 DATA MOZAMBIQUE,MAPUTO,NEPAL,KATMANDU,THE NETHERLANDS,
AMSTERDAM
21250 DATA NEW ZEALAND,WELLINGTON,NICARAGUA,MANAGUA,NIGER,NI
AMEY
21260 DATA NIGERIA,LAGOS,NORWAY,OSLO,OMAN,MUSCAT,PAKISTAN,IS
LAMBAD
21270 DATA PANAMA,PANAMA,PARAGUAY,ASUNCION,PERU,LIMA
21280 DATA PHILIPPINES,QUEZON CITY,POLAND,WARSAW,PORTUGAL,LI
SBON
21290 DATA RHODESIA,SALISBURY,ROMANIA,BUCHAREST,SAUDI ARABIA
,RIYADH
21300 DATA SENEGAL,DAKAR,SIERRA LEONE,FREETOWN,SOMALIA,MOGAD
ISHU
21310 DATA REP. OF S. AFRICA,PRETORIA & CAPE TOWN,SPAIN,MADR
ID
21320 DATA SRI LANKA,COLOMBO,SUDAN,KHARTOUM,SWEDEN,STOCKHOLM
21330 DATA SWITZERLAND,BERN,SYRIA,DAMASCUS,TANZANIA,DAR ES S
ALAAM
21340 DATA THAILAND,BANGKOK,TOGO,LOME,TONGA,NUKUALOFA
21350 DATA TRINIDAD & TOBAGO,PORT OF SPAIN,TUNISIA,TUNIS,TUR
KEY,ANKARA
21360 DATA UGANDA,KAMPALA,RUSSIA (USSR),MOSCOW,UNITED ARAB E
MIRATES,ABU DHABI
21370 DATA UNITED KINGDOM,LONDON,URUGUAY,MONTEVIDEO,VENEZUEL
A,CARACAS
21380 DATA VIETNAM,HANOI,YUGOSLAVIA,BELGRADE,ZAIRE,KINSHASA,
ZAMBIA,LUSAKA
21390 DATA EOF,EOF
```

TABLE OF VARIABLES

```
TL
   1010    1020    1020    1030    1030    1050
   1130    1200    1200    1210    4060

N(
   1030    4060    4080    4080    4090    4110
   4110    4110    4110    4110    4110    4120
   4120    4120    4120    4120    4120    4160
   4160    4170    4170    4180    4180    4190
   4190    4270    4270    4280    4280    4290
   4290    4300    4300
```

CA$
```
    1030    1060    1080    1150    4160    4170
    4180    4190    4320    4430    4460    4550
    4560    4560    4570
```

NA$
```
    1030    1080    1160    4220    4270    4280
    4290    4300    4420    4480    4580    4590
    4590    4600
```

I
```
    1050    1060    1060    1070    1130    1180
    4050    4060    4070    18010   18030   19010
    19020
```

G
```
    1190    4650    4650    4740    4740    4750
```

BL
```
    1210    4560    4560    4570    4570    4590
    4590    4600    4600    4610    4610    4620
    10010
```

N
```
    1220    4510    4510    4530    4750
```

L
```
    2010    2310    2330    18010
```

DE
```
    2050    4630    19010
```

SE
```
    2290    2300    2300    4130    4390
```

C
```
    4030    4080    4090    4360
```

R
```
    4090    4220    4220    4320    4320    4420
    4420    4430    4430    4460    4460    4480
    4480    4550    4550    4560    4560    4580
    4580    4590    4590    10010
```

SA
```
    4340    4350    4350    4360
```

S$
```
    1040    1100    4550    4570    4580    4600
```

SA$
```
    1040    1100    4690    4700    4700    4780
    4800    4800
```

CAI$
 1040 1090 1100 1100 1100 1140
 1150

NAI$
 1040 1100 1140 1160

LN
 1120 1150 1160 1170 1170

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   CAPITALS OF NATIONS BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM   INITIALIZATION
1010 TL = 114
1020 DIM N(4),CA$(TL),NA$(TL)
1030 REM      READ IN NATION : CAPITAL ARRAYS
1040 FOR  I = 1  TO  TL
1050 READ NA$(I),CA$(I)
1060 NEXT I
1070 G = 0
1080 BL = TL
1090 N = 0
1100 REM USE FULL SCREEN
1110 POKE 82,0
2000 REM   INTRODUCTION
2010 L = 12
2020 GOSUB 18000
2030 PRINT "          NATIONS AND CAPITALS"
2040 GOSUB 18000
2050 DE = 1000
2060 GOSUB 19000
2070 GOSUB 18000
2080 PRINT "THIS IS A PROGRAM WHICH WILL TEST YOUR"
2090 PRINT "KNOWLEDGE OF NATIONS AND THEIR"
2100 PRINT "CAPITALS."
2110 PRINT
2120 PRINT "YOU WILL BE GIVEN MULTIPLE CHOICE"
2130 PRINT "QUESTIONS WHICH HAVE FOUR ANSWERS EACH."
2140 PRINT
2150 PRINT "YOU SHOULD ANSWER WITH A '1,' '2,'"
2160 PRINT "'3,' OR '4.'"
2170 PRINT
2180 PRINT "TO STOP AT ANY TIME, TYPE IN A '0'"
2190 PRINT "FOR AN ANSWER."
2200 PRINT
2210 PRINT "YOU HAVE A CHOICE:"
2220 PRINT "    1. BE GIVEN THE NATION"
2230 PRINT "       AND ANSWER WITH THE CAPITAL"
2240 PRINT
2250 PRINT "    2. BE GIVEN THE CAPITAL"
2260 PRINT "       AND ANSWER WITH THE NATION"
2270 PRINT
2280 PRINT "PICK '1' OR '2'"
2290 INPUT SE
```

```
2300 IF SE < 1 OR SE > 2 THEN 2280
2310 L = 18
2320 GOSUB 18000
2330 L = 9
4000 REM    MAIN PROGRAM
4010 GOSUB 10000
4020 REM  C IS POSITION OF CORRECT ANSWER
4030 C = RND(4)
4040 REM  PICK THREE NUMBERS
4050 FOR I = 1 TO 3
4060 N(I) =  RND(TL)
4070 NEXT  I
4080 N(4) = N(C)
4090 N(C) = R
4100 REM  MAKE CERTAIN ALL FOUR NUMBERS DIFFER
4110 IF N(1) = N(2) OR N(1) = N(3) OR N(1) = N(4) THEN 4050
4120 IF N(2) = N(3) OR N(2) = N(4) OR N(3) = N(4) THEN 4050
4130 IF SE = 2 THEN 4230
4140 REM  PRINT CAPITALS
4150 GOSUB 18000
4160 PRINT "1.";CA$(N(1))
4170 PRINT "2.";CA$(N(2))
4180 PRINT "3.";CA$(N(3))
4190 PRINT "4.";CA$(N(4))
4200 GOSUB 18000
4210 PRINT   "THE CAPITAL OF ";NA$(R);" IS";
4220 GOTO 4310
4230 REM  PRINT NATIONS
4240 GOSUB 18000
4250 PRINT "1.";NA$(N(1))
4260 PRINT "2.";NA$(N(2))
4270 PRINT "3.";NA$(N(3))
4280 PRINT "4.";NA$(N(4))
4290 GOSUB 18000
4300 PRINT CA$(R);" IS THE CAPITAL OF ";
4310 INPUT SA
4320 IF SA < 1 OR SA > 4 THEN 4610
4330 IF SA = C THEN 4430
4340 PRINT
4350 PRINT "WRONG!"
4360 IF SE = 2 THEN  GOTO 4400
4370 PRINT
4380 PRINT "THE CAPITAL OF ";NA$(R);" IS ";CA$(R);"."
4390 GOTO 4560
4400 PRINT
4410 PRINT CA$(R);" IS THE CAPITAL OF ";NA$(R);"."
4420 GOTO 4560
4430 REM
4440 N = N + 1
4450 PRINT
4460 PRINT "RIGHT! YOU HAVE ";N;" CORRECT!"
4470 REM  REMOVE CORRECT ANSWER FROM LIST
4480 S$ = CA$(R)
4490 CA$(R) = CA$(BL)
4500 CA$(BL) = S$
4510 S$ = NA$(R)
4520 NA$(R) = NA$(BL)
4530 NA$(BL) = S$
```

```
4540 BL = BL - 1
4550 IF BL = 0 THEN  GOTO 4670
4560 DE = 1000
4570 GOSUB 19000
4580 G = G + 1
4590 GOTO 4010
4600 REM  STOP?
4610 PRINT "DO YOU WANT TO STOP";
4620 INPUT SA$
4630 IF SA$ = "Y" OR SA$ = "YES" THEN 4680
4640 PRINT "WHAT WAS YOUR ANSWER"
4650 PRINT "TO THE LAST PROBLEM";
4660 GOTO 4310
4670 G = G + 1
4680 PRINT "YOU GOT ";N;" RIGHT IN ";G;" GUESSES"
4690 PRINT
4700 PRINT "WOULD YOU LIKE TO TRY AGAIN";
4710 INPUT SA$
4720 PRINT
4730 IF SA$ = "Y" OR SA$ = "YES" THEN  GOTO 1070
4740 END
10000 REM    RANDOMIZATION
10010 R =  RND(BL)
10020 RETURN
18000 REM  SCROLLING
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM  DELAY
19010 FOR I = 1 TO DE
19020 NEXT I
19030 RETURN
21000 REM  DATA
21010 DATA "AFGHANISTAN","KABUL","ALBANIA","TIRANA","ALGERIA
","ALGIERS"
21020 DATA "ANGOLA","LUANDA","ARGENTINA","BUENOS AIRES","AUS
TRALIA","CANBERRA"
21030 DATA "AUSTRIA","VIENNA","THE BAHAMAS","NASSAU","BANGLA
DESH","DACCA"
21040 DATA "BARBADOS","BRIDGETOWN","BELGIUM","BRUSSELS","BOL
IVIA","SUCRE"
21050 DATA "BOTSWANA","GABORONE","BRAZIL","BRASILIA","BULGAR
IA","SOFIA"
21060 DATA "BURMA","RANGOON","CAMBODIA","PHNOM PENH","CANADA
","OTTAWA"
21070 DATA "CHILE","SANTIAGO","PEOPLE'S REPUBLIC OF CHINA","
PEKING"
21080 DATA "REPUBLIC OF CHINA","TAIPEI","COLOMBIA","BOGOTA",
"COSTA RICA","SAN JOSE"
21090 DATA "CUBA","HAVANA","CYPRUS","NICOSIA","CZECHOSLOVAKI
A","PRAGUE"
21100 DATA "DENMARK","COPENHAGEN","DOMINICAN REPUBLIC","SANT
O DOMINGO"
21110 DATA "ECUADOR","QUITO","EGYPT","CAIRO","EL SALVADOR","
SAN SALVADOR"
21120 DATA "ETHIOPIA","ADDIS ABABA","FIJI","SUVA","FINLAND",
"HELSINKI"
```

```
21130 DATA "FRANCE","PARIS","GERMANY","BERLIN","GHANA","ACCR
A","GREECE","ATHENS"
21140 DATA "GUATEMALA","GUATEMALA CITY","HAITI","PORT-AU-PRI
NCE","HONDURAS","TEGUCIGALPA"
21150 DATA "HUNGARY","BUDAPEST","ICELAND","REYKJAVIK","INDIA
","NEW DELHI"
21160 DATA "INDONESIA","JAKARTA","IRAN","TEHRAN","IRAQ","BAG
HDAD"
21170 DATA "IRELAND","DUBLIN","ISRAEL","JERUSALEM","ITALY","
ROME"
21180 DATA "JAMAICA","KINGSTON","JAPAN","TOKYO","JORDON","AM
MAN","KENYA","NAIROBI"
21190 DATA "SOUTH KOREA","SEOUL","KUWAIT","KUWAIT CITY","LAO
S","VIENTIANE"
21200 DATA "LEBANON","BEIRUT","LIBERIA","MONROVIA","LIBYA","
TRIPOLI"
21210 DATA "LIECHTENSTEIN","VADUZ","MADAGASCAR","TANANARIVE"
,"MALAYSIA","KUALA LUMPUR"
21220 DATA "MALI","BAMAKO","MALTA","VALETTA","MAURITANIA","N
OUAKCHOTT"
21230 DATA "MEXICO","MEXICO CITY","MONGOLIA","ULAN BATOR","M
OROCCO","RABAT"
21240 DATA "MOZAMBIQUE","MAPUTO","NEPAL","KATMANDU","THE NET
HERLANDS","AMSTERDAM"
21250 DATA "NEW ZEALAND","WELLINGTON","NICARAGUA","MANAGUA",
"NIGER","NIAMEY"
21260 DATA "NIGERIA","LAGOS","NORWAY","OSLO","OMAN","MUSCAT"
,"PAKISTAN","ISLAMBAD"
21270 DATA "PANAMA","PANAMA","PARAGUAY","ASUNCION","PERU","L
IMA"
21280 DATA "PHILIPPINES","QUEZON CITY","POLAND","WARSAW","PO
RTUGAL","LISBON"
21290 DATA "RHODESIA","SALISBURY","ROMANIA","BUCHAREST","SAU
DI ARABIA","RIYADH"
21300 DATA "SENEGAL","DAKAR","SIERRA LEONE","FREETOWN","SOMA
LIA","MOGADISHU"
21310 DATA "REPUBLIC OF SOUTH AFRICA","PRETORIA AND CAPE TOW
N","SPAIN","MADRID"
21320 DATA "SRI LANKA","COLOMBO","SUDAN","KHARTOUM","SWEDEN"
,"STOCKHOLM"
21330 DATA "SWITZERLAND","BERN","SYRIA","DAMASCUS","TANZANIA
","DAR ES SALAAM"
21340 DATA "THAILAND","BANGKOK","TOGO","LOME","TONGA","NUKUA
LOFA"
21350 DATA "TRINIDAD : TOBAGO","PORT OF SPAIN","TUNISIA","TU
NIS","TURKEY","ANKARA"
21360 DATA "UGANDA","KAMPALA","RUSSIA (USSR)","MOSCOW","UNIT
ED ARAB EMIRATES","ABU DHABI"
21370 DATA "UNITED KINGDOM","LONDON","URUGUAY","MONTEVIDEO",
"VENEZUELA","CARACAS"
21380 DATA "VIETNAM","HANOI","YUGOSLAVIA","BELGRADE","ZAIRE"
,"KINSHASA","ZAMBIA","LUSAKA"
```

TABLE OF VARIABLES

BL - BOTTOM OF LIST MARKER
1080 4490 4500 4520 4530 4540
4540 4550 10010

C - POSITION OF CORRECT ANSWER
4030 4080 4090 4330

CA$(*) - CAPITALS LIST
1020 1050 4160 4170 4180 4190
4300 4380 4410 4480 4490 4490
4500

DE - DELAY
2050 4560 19010

G - NUMBER OF GUESSES
1070 4580 4580 4670 4670 4680

I - COUNTER
1040 1050 1050 1060 4050 4060
4070 18010 18030 19010 19020

L - LINES OF SCROLLING
2010 2310 2330 18010

N - NUMBER CORRECT
1090 4440 4440 4460 4680

N(*) - ANSWER ARRAY
1020 4060 4080 4080 4090 4110
4110 4110 4110 4110 4110 4120
4120 4120 4120 4120 4120 4160
4170 4180 4190 4250 4260 4270
4280

NA$(*) - NATIONS LIST
1020 1050 4210 4250 4260 4270
4280 4380 4410 4510 4520 4520
4530

R - RANDOM NUMBER
4090 4210 4300 4380 4380 4410
4410 4480 4490 4510 4520 10010

S$ - TRANSFER VARIABLE
4480 4500 4510 4530

SA - STUDENT ANSWER
4310 4320 4320 4330

SA$ - STUDENT ANSWER
4620 4630 4630 4710 4730 4730

SE - PRESENTATION MODE
2290 2300 2300 4130 4360

TL - NUMBER OF PAIRS IN LIST
1010 1020 1020 1040 1080 4060

END OF VAR. LIST

SAMPLE RUN

THIS IS A PROGRAM WHICH WILL TEST YOUR
KNOWLEDGE OF NATIONS AND THEIR
CAPITALS.

YOU WILL BE GIVEN MULTIPLE CHOICE
QUESTIONS WHICH HAVE FOUR ANSWERS EACH.

YOU SHOULD ANSWER WITH A '1,' '2,'
'3,' OR '4.'

TO STOP AT ANY TIME, TYPE IN A 'O'
FOR AN ANSWER.

YOU HAVE A CHOICE:
    1. BE GIVEN THE NATION
       AND ANSWER WITH THE CAPITAL

    2. BE GIVEN THE CAPITAL
       AND ANSWER WITH THE NATION

PICK '1' OR '2'
?1

1.RANGOON
2.PANAMA
3.ROME
4.TEHRAN

THE CAPITAL OF PANAMA IS?2

RIGHT! YOU HAVE 1 CORRECT!

1.VIENNA
2.TEGUCIGALPA
3.PANAMA
4.DACCA

THE CAPITAL OF AUSTRIA IS?1

RIGHT! YOU HAVE 2 CORRECT!

1.DACCA
2.FREETOWN

```
3.WARSAW
4.HANOI


THE CAPITAL OF SIERRA LEONE IS?2

RIGHT! YOU HAVE 3 CORRECT!


1.PRAGUE
2.AMSTERDAM
3.TEHRAN
4.OSLO


THE CAPITAL OF IRAN IS?3

RIGHT! YOU HAVE 4 CORRECT!


1.DUBLIN
2.MEXICO CITY
3.MOGADISHU
4.SEOUL


THE CAPITAL OF IRELAND IS?3

WRONG!

THE CAPITAL OF IRELAND IS DUBLIN.


1.KAMPALA
2.BRIDGETOWN
3.BERN
4.ASUNCION


THE CAPITAL OF UGANDA IS?0
DO YOU WANT TO STOP?YES
YOU GOT 4 RIGHT IN 5 GUESSES

WOULD YOU LIKE TO TRY AGAIN?NO
```
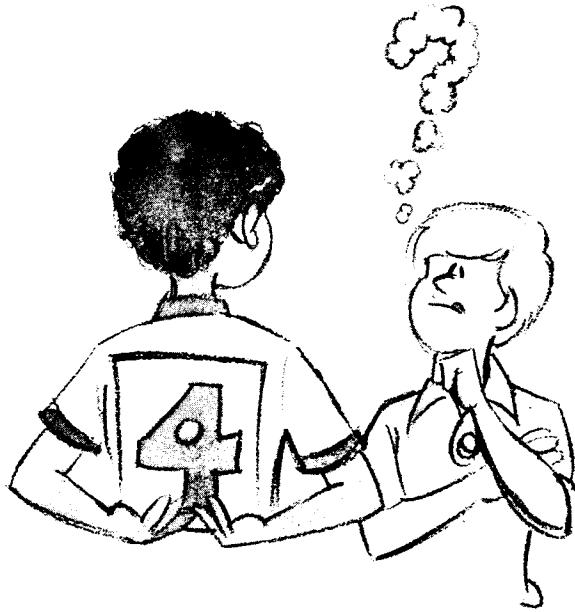
Guess the Numbers

PROGRAM DESCRIPTION

The skills of addition, subtraction, multiplication, and division are tested in this program. The computer picks two numbers and adds, subtracts, multiplies, and divides them. The answers, which are a result of the two numbers being added, subtracted, multiplied, or divided, are displayed. You are to try to guess which two numbers were used to obtain the list of answers shown to you.

PROGRAM NOTES

1. For a less complicated game, always present the four "results" in the same order.

2. Line 10080 eliminates number pairs that don't divide evenly. What happens if you remove it?

PROGRAM LISTING: BASIC

```
100 REM GUESS THE NUMBERS BY GARY ORWIG
1000 REM INITIALIZATION
1010 DIM P(4)
1020 DIM NA$(30)
1030 DIM S$(20)
1040 REM USE FULL SCREEN
1050 POKE 82,0
1060 PRINT
2000 REM INTRODUCTION
2010 FOR I=1 TO 130
2020 PRINT INT(RND(0)*10000);"    ";
```

```
2030 NEXT I
2040 FOR I=1 TO 2000
2050 NEXT I
2060 FOR I=1 TO 25
2070 PRINT
2080 NEXT I
2090 PRINT "            GUESS THE NUMBERS"
2100 FOR I=1 TO 10
2110 PRINT
2120 NEXT I
2130 PRINT "WHAT IS YOUR NAME?"
2140 INPUT NA$
2150 PRINT
2160 PRINT "IT'S NICE TO MEET YOU, ";NA$;"."
2170 PRINT
2180 PRINT
2190 PRINT "I WILL THINK OF TWO NUMBERS AND"
2200 PRINT "ADD, SUBTRACT, MULTIPLY, AND"
2210 PRINT "DIVIDE THEM.  I WILL THEN MIX UP"
2220 PRINT "THE ANSWERS AND SHOW THEM TO YOU."
2230 PRINT
2240 PRINT "IT WILL BE YOUR JOB TO FIGURE OUT"
2250 PRINT "THE ORIGINAL TWO NUMBERS!"
2260 PRINT
2270 PRINT
2280 PRINT "WHAT IS THE LARGEST NUMBER YOU"
2290 PRINT "WANT TO WORK WITH, ";NA$
2300 INPUT MX
2310 PRINT
2320 PRINT "OK, I WILL TRY NOT TO GIVE YOU"
2330 PRINT "PROBLEMS THAT HAVE ANSWERS OVER ";MX;"."
2340 FOR I=1 TO 2000
2350 NEXT I
2360 PRINT
2370 PRINT
2380 PRINT "HERE WE GO!"
2390 PRINT
2400 PRINT
4000 REM MAIN PROGRAM
4010 I=0
4020 GOSUB 10000
4030 GOSUB 10500
4040 P(1)=E
4050 GOSUB 10500
4060 IF E=P(1) THEN 4050
4070 P(2)=E
4080 GOSUB 10500
4090 IF E=P(1) OR E=P(2) THEN 4080
4100 P(3)=E
4110 P(4)=10-(P(1)+P(2)+P(3))
4120 I=I+1
4130 IF I=5 THEN 4230
4140 ON P(I) GOTO 4150,4170,4190,4210
4150 PRINT A+B;"     ";
4160 GOTO 4120
4170 PRINT A-B;"     ";
4180 GOTO 4120
4190 PRINT A*B;"     ";
```

```
4200 GOTO 4120
4210 PRINT A/B;"        ";
4220 GOTO 4120
4230 PRINT
4240 PRINT "WHAT DO YOU THINK THE TWO"
4250 PRINT "NUMBERS ARE?  TYPE THEM IN"
4260 PRINT "LIKE THIS: 6,9"
4270 INPUT S1,S2
4280 TR=TR+1
4290 GOSUB 11000
4300 IF HT=1 THEN 4340
4310 GOSUB 14000
4320 I=0
4330 GOTO 4120
4340 HT=0
4350 GOSUB 12000
10000 REM RANDOMIZATION
10010 A=INT(RND(O)*MX)+1
10020 B=INT(RND(O)*MX)+1
10030 IF A<B THEN 10050
10040 GOTO 10080
10050 D=B
10060 B=A
10070 A=D
10080 IF A/B>INT(A/B) THEN 10010
10090 RETURN
10500 REM PRESENTATION ORDER
10510 E=INT(RND(O)*4)+1
10520 RETURN
11000 REM JUDGE ANSWERS
11010 IF S1=A THEN GOTO 11040
11020 IF S1=B THEN 11060
11030 GOTO 11100
11040 IF S2=B THEN 11080
11050 GOTO 11100
11060 IF S2=A THEN GOTO 11080
11070 GOTO 11100
11080 HT=1
11090 RETURN
11100 HT=0
11110 I=0
11120 RETURN
12000 REM REWARD
12010 FOR I=1 TO 50
12020 PRINT "          YOU FOUND THEM!";
12030 NEXT I
12040 GOTO 15000
14000 REM WRONG ANSWER
14010 PRINT
14020 PRINT "SORRY!  TRY AGAIN!"
14030 PRINT
14040 RETURN
15000 PRINT
15010 PRINT
15020 PRINT
15030 PRINT "IT TOOK ";TR;" TRIES!"
15040 PRINT
15050 PRINT
```

```
15060 PRINT
15070 PRINT "DO YOU WANT ANOTHER PROBLEM?"
15080 PRINT "(YES OR NO)"
15090 INPUT S$
15100 IF S$="YES" THEN 15130
15110 PRINT "BYE FOR NOW!"
15120 END
15130 TR=0
15140 HT=0
15150 I=0
15160 GOTO 4000
```

TABLE OF VARIABLES

P(

1010	4040	4060	4070	4090	4090
4100	4110	4110	4110	4110	4140

NA$

1020	2140	2160	2290

S$

1030	15090	15100

I

2010	2030	2040	2050	2060	2080
2100	2120	2340	2350	4010	4120
4120	4130	4140	4320	11110	12010
12030	15150				

MX

2300	2330	10010	10020

E

4040	4060	4070	4090	4090	4100
10510					

A

4150	4170	4190	4210	10010	10030
10060	10070	10080	10080	11010	11060

B

4150	4170	4190	4210	10020	10030
10050	10060	10080	10080	11020	11040

S1

4270	11010	11020

S2

4270	11040	11060

TR

4280	4280	15030	15130

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   GUESS THE NUMBERS BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM   INITIALIZATION
1010 DIM P(4)
1020 REM USE FULL SCREEN
1030 POKE 82,0
2000 REM     INTRODUCTION
2010 FOR I = 1 TO 200
2020 PRINT  RND(9999);"   ";
2030 NEXT I
2040 FOR I = 1 TO 3000
2050 NEXT I
2060 FOR I = 1 TO 25
2070 PRINT
2080 NEXT I
2090 PRINT "          GUESS THE NUMBERS"
2100 FOR I = 1 TO 10
2110 PRINT
2120 NEXT I
2130 PRINT "WHAT IS YOUR NAME?"
2140 INPUT NA$
2150 PRINT
2160 PRINT "IT'S NICE TO MEET YOU, ";NA$;"."
2170 PRINT
2180 PRINT
2190 PRINT "I WILL THINK OF TWO NUMBERS AND"
2200 PRINT "ADD, SUBTRACT, MULTIPLY, AND"
2210 PRINT "DIVIDE THEM.  I WILL THEN MIX UP"
2220 PRINT "THE ANSWERS AND SHOW THEM TO YOU."
2230 PRINT
2240 PRINT "IT WILL BE YOUR JOB TO FIGURE OUT"
2250 PRINT "THE ORIGINAL TWO NUMBERS!"
2260 PRINT
2270 PRINT
2280 PRINT "WHAT IS THE LARGEST NUMBER YOU"
2290 PRINT "WANT TO WORK WITH, ";NA$
2300 INPUT MX
2310 PRINT
2320 PRINT "OK, I WILL TRY NOT TO GIVE YOU"
2330 PRINT "PROBLEMS THAT HAVE ANSWERS OVER ";MX;"."
2340 FOR I = 1 TO 2000
2350 NEXT I
2360 PRINT
2370 PRINT
2380 PRINT "HERE WE GO!"
2390 PRINT
2400 PRINT
```

```
4000 REM   MAIN PROGRAM
4010 I = 0
4020 GOSUB 10000
4030 GOSUB 10500
4040 P(1) = E
4050 GOSUB 10500
4060 IF E = P(1) THEN 4050
4070 P(2) = E
4080 GOSUB 10500
4090 IF E = P(1) OR E = P(2) THEN 4080
4100 P(3) = E
4110 P(4) = 10 - (P(1) + P(2) + P(3))
4120 I = I + 1
4130 IF I = 5 THEN 4230
4140 ON P(I) GOTO 4150,4170,4190,4210
4150 PRINT A + B;"      ";
4160 GOTO 4120
4170 PRINT A - B;"      ";
4180 GOTO 4120
4190 PRINT A * B;"      ";
4200 GOTO 4120
4210 PRINT A / B;"      ";
4220 GOTO 4120
4230 PRINT
4240 PRINT "WHAT DO YOU THINK THE TWO"
4250 PRINT "NUMBERS ARE?  TYPE THEM IN"
4260 PRINT "LIKE THIS: 6,7"
4270 INPUT S1,S2
4280 TR = TR + 1
4290 GOSUB 11000
4300 IF HT = 1 THEN 4340
4310 GOSUB 14000
4320 I = 0
4330 GOTO 4120
4340 HT = 0
4350 GOSUB 12000
10000 REM    RANDOMIZATION
10010 A =   RND(MX)
10020 B =   RND(MX)
10030 IF A < B THEN 10050
10040 GOTO 10080
10050 D = B
10060 B = A
10070 A = D
10080 IF A / B >  INT (A / B) THEN 10010
10090 RETURN
10500 REM    PRESENTATION ORDER
10510 E =   RND(4)
10520 RETURN
11000 REM  JUDGE ANSWERS
11010 IF S1 = A GOTO 11040
11020 IF S1 = B THEN 11060
11030 GOTO 11100
11040 IF S2 = B THEN 11080
11050 GOTO 11100
11060 IF S2 = A GOTO 11080
11070 GOTO 11100
11080 HT = 1
```

24

```
11090 RETURN
11100 HT = O
11110 I = O
11120 RETURN
12000 REM   REWARD
12010 FOR I = 1 TO 50
12020 PRINT "          YOU FOUND THEM!";
12030 NEXT I
12040 GOTO 15000
14000 REM   WRONG ANSWER
14010 PRINT
14020 PRINT "SORRY!  TRY AGAIN!"
14030 PRINT
14040 RETURN
15000 PRINT
15010 PRINT
15020 PRINT
15030 PRINT "IT TOOK ";TR;" TRIES!"
15040 PRINT
15050 PRINT
15060 PRINT
15070 PRINT "DO YOU WANT ANOTHER PROBLEM?"
15080 PRINT "(YES OR NO)
15090 INPUT S$
15100 IF S$ = "YES" THEN 15130
15110 PRINT "BYE FOR NOW!"
15120 END
15130 TR = O
15140 HT = O
15150 I = O
15160 GOTO 4000
```

TABLE OF VARIABLES

A — ONE NUMBER
4150 4170 4190 4210 10010 10030
10060 10070 10080 10080 11010
11060

B — THE OTHER NUMBER
4150 4170 4190 4210 10020 10030
10050 10060 10080 10080 11020
11040

D — TRANSFER VARIABLE
10050 10070

E — PRESENTATION ORDER
4040 4060 4070 4090 4090 4100
10510

HT — HIT
4300 4340 11080 11100 15140

I — COUNTER
2010 2030 2040 2050 2060 2080
2100 2120 2340 2350 4010 4120

```
4120 4130 4140 4320 11110 12010
12030 15150
```

MX - MAXIMUM SIZE
```
2300 2330 10010 10020
```

NA$ - NAME
```
2140 2160 2290
```

P(*) - PRESENTATION ORDER
```
1010 4040 4060 4070 4090 4090
4100 4110 4110 4110 4110 4140
```

S$ - STUDENT ANSWER
```
15090 15100
```

S1 - STUDENT ANSWER
```
4270 11010 11020
```

S2 - STUDENT ANSWER
```
4270 11040 11060
```

TR - NUMBER OF TRIES
```
4280 4280 15030 15130
```

END OF VAR. LIST

SAMPLE RUN

WHAT IS YOUR NAME?
?JOYCE

IT'S NICE TO MEET YOU, JOYCE.

I WILL THINK OF TWO NUMBERS AND
ADD, SUBTRACT, MULTIPLY, AND
DIVIDE THEM. I WILL THEN MIX UP
THE ANSWERS AND SHOW THEM TO YOU.

IT WILL BE YOUR JOB TO FIGURE OUT
THE ORIGINAL TWO NUMBERS!

WHAT IS THE LARGEST NUMBER YOU
WANT TO WORK WITH, JOYCE
?20

OK, I WILL TRY NOT TO GIVE YOU
PROBLEMS THAT HAVE ANSWERS OVER 20.

HERE WE GO!


```
   2    24    8    128
```
WHAT DO YOU THINK THE TWO

```
NUMBERS ARE?   TYPE THEM IN
LIKE THIS: 6,7
?12,2

SORRY!   TRY AGAIN!

2    24    8    128
WHAT DO YOU THINK THE TWO
NUMBERS ARE?   TYPE THEM IN
LIKE THIS: 6,7
?8,16
          YOU FOUND THEM!        YOU FOUND THEM!          YOU FO
UND THEM!          YOU FOUND THEM!        YOU FOUND THEM!
    YOU FOUND THEM!          YOU FOUND THEM!          YOU FOUND T
HEM!          YOU FOUND THEM!        YOU FOUND THEM!


IT TOOK 2 TRIES!



DO YOU WANT ANOTHER PROBLEM?
(YES OR NO)
?NO
BYE FOR NOW!
```
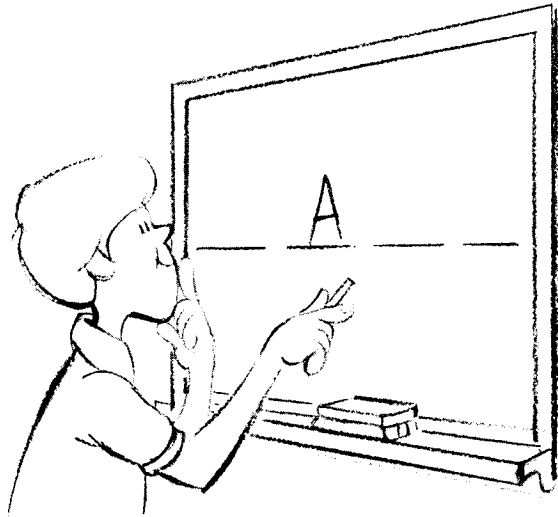
Guess the Word

PROGRAM DESCRIPTION

Spelling skills and word recognition are practiced in this program. The computer selects a word from an instructor-made data file and then presents an appropriate number of blanks to be filled by letters. You try to guess the letters that make up the selected word. At any point, you may enter an "!". This will allow you to guess the whole word and reduce the number of times it takes you to guess the word. The computer also gives you one hint when you enter a "?".

PROGRAM NOTES

If you are a real graphics whiz, develop a subroutine that will gradually "hang" a man and slip it into the 14000 section of the program. If you prefer less violence, draw a robot that gradually walks off a cliff.

Of course, you can enter your own words in the data section (lines 21000 ...). Just enter each word followed by its hint. Set TL equal to the number of words.

PROGRAM LISTING: BASIC

```
100 REM GUESS THE WORD BY GARY ORWIG
1000 REM INITIALIZATION - SET 'TL' TO TOTAL NUMBER OF WORDS
IN YOUR DATA SET.
1010 TL=20
1020 BL=TL
1030 TL=TL+1
```

```
1040 DIM A$(20),B$(20),FL$(TL*20),HN$(TL*20),C$(20),GS$(40),
NA$(30),S$(20),WD$(20),FLI$(20),HNI$(20)
1050 FOR I=1 TO TL
1060 FL$(I*20-19)="                    "
1070 NEXT I
1080 HN$=FL$
1090 A$="                         "
1100 B$=A$:C$=A$:S$=A$:WD$=A$:GS$(1)=A$:GS$(21)=A$:FLI$=A$:H
NI$=A$
1110 LN=1
1120 FOR I=1 TO TL
1130 READ FLI$,HNI$
1140 FL$(LN)=FLI$
1150 HN$(LN)=HNI$
1160 LN=LN+20
1170 NEXT I
1180 GS$=""
1190 REM USE FULL SCREEN
1200 POKE 82,0
1210 PRINT
1220 TL=TL-1
2000 REM INTRODUCTION
2010 FOR I=1 TO 12
2020 PRINT
2030 NEXT I
2040 PRINT "      GUESS THE WORD"
2050 FOR I=1 TO 12
2060 PRINT
2070 NEXT I
2080 FOR I=1 TO 150
2090 NEXT I
2100 PRINT "WHAT IS YOUR NAME";
2110 INPUT NA$
2120 PRINT "I AM HAPPY TO MEET YOU, ";NA$;"."
2130 PRINT
2140 PRINT
2150 PRINT
2160 PRINT "I AM GOING TO THINK OF A WORD,"
2170 PRINT "AND IT WILL BE YOUR JOB TO"
2180 PRINT "GUESS IT.  YOU DO THIS BY"
2190 PRINT "GUESSING ONE LETTER AT A TIME."
2200 PRINT
2210 PRINT "AT ANY TIME YOU CAN TYPE IN"
2220 PRINT "AN '!' AND THEN GUESS THE WHOLE"
2230 PRINT "WORD.  IF YOU NEED A HINT, TYPE"
2240 PRINT "IN A '?' AND I WILL TRY TO HELP YOU."
2250 PRINT
2260 PRINT
2270 PRINT "HERE WE GO!"
2280 PRINT
2290 PRINT
4000 REM MAIN PROGRAM
4010 GOSUB 10000
4020 C$=FL$(R*20-19,R*20)
4030 L=0
4040 L=L+1
4050 IF C$(L,L)=" " THEN 4070
4060 GOTO 4040
```

```
4070 L=L-1
4080 C$=C$(1,L)
4090 FOR I=1 TO L
4100 A$(I)=C$(I,I)
4110 B$(I)="*"
4120 NEXT I
4130 GOSUB 18000
4140 PRINT
4150 PRINT
4160 PRINT
4170 PRINT "GUESS A LETTER (OR '?' OR '!')."
4180 HT=0
4190 INPUT S$
4200 IF LEN(S$)=1 THEN 4230
4210 PRINT "TYPE IN ONLY ONE LETTER!"
4220 GOTO 4190
4230 GOSUB 11000
4240 IF HT=2 THEN 4170
4250 TR=TR+1
4260 IF HT=1 THEN 4300
4270 GOSUB 14000
4280 GOSUB 18000
4290 GOTO 4140
4300 HT=0
4310 GOSUB 12000
4320 GOSUB 18000
4330 GOSUB 15000
4340 GOTO 4140
10000 REM RANDOMIZATION
10010 R=INT(RND(O)*BL)+1
10020 RETURN
11000 REM JUDGE ANSWER
11010 IF S$="?" THEN 16000
11020 IF S$="!" THEN 17000
11030 FOR I=1 TO L
11040 IF A$(I,I)=S$ THEN 11070
11050 NEXT I
11060 RETURN
11070 HT=1
11080 B$(I,I)=S$
11090 NEXT I
11100 RETURN
12000 REM REWARD
12010 PRINT "GOOD GUESS, ";NA$;"!"
12020 RETURN
14000 REM WRONG GUESS
14010 PRINT "THERE ARE NO ";S$;"'S IN"
14020 PRINT "THE WORD, ";NA$;"."
14030 RETURN
15000 REM SCORE KEEPING
15010 IF WD$=C$ THEN 15030
15020 RETURN
15030 PRINT "YOU FOUND THE WORD IN ";TR;" TRIES!"
15040 GOTO 20000
16000 REM HINT
16010 PRINT
```

```
16020 PRINT HN$(R*20-19,R*20)
16030 HN$(R*20-19,R*20)="NO MORE HINTS!"
16040 HT=2
16050 RETURN
17000 REM SEE IF STUDENT KNOWS WORD
17010 PRINT "WHAT DO YOU THINK THE WORD IS";
17020 INPUT S$
17030 IF S$=C$ THEN 15030
17040 PRINT "SORRY--KEEP TRYING"
17050 HT=2
17060 GOTO 14000
18000 REM PRINT ROUTINE
18010 WD$="                    "
18020 WD$=""
18030 FOR I=1 TO L
18040 WD$(LEN(WD$)+1)=B$(I,I)
18050 NEXT I
18060 GS$(LEN(GS$)+1)=S$(1,1)
18070 PRINT
18080 PRINT WD$
18090 PRINT
18100 PRINT "LETTERS GUESSED: ";GS$
18110 RETURN
20000 REM CLOSING
20010 PRINT "WOULD YOU LIKE ANOTHER WORD (YES OR NO)";
20020 INPUT S$
20030 IF S$="NO" THEN 20200
20040 TR=0
20050 HT=0
20060 WD$="                    "
20070 GS$=WD$
20080 S$=WD$
20090 WD$=" "
20100 GS$=" "
20110 S$=" "
20120 REM DELETE CORRECT WORD FROM LIST
20130 FL$(R*20-19,R*20)=FL$(BL*20-19,BL*20)
20140 HN$(R*20-19,R*20)=HN$(BL*20-19,BL*20)
20150 BL=BL-1
20160 IF BL=0 THEN GOTO 20180
20170 GOTO 4010
20180 PRINT "SORRY! YOU HAVE USED ALL THE"
20190 PRINT "WORDS I KNOW, ";NA$;"!"
20200 END
21000 REM DATA
21010 DATA EVENING,DARK,COMPUTER,DIGITAL
21020 DATA RHYTHM,MUSIC,QUIZ,TEST,LYNX,CAT,KNOCK,TAP,UGLY,MO
NSTER
21030 DATA VULTURE,BIRD,YAWN,MOUTH,ERUPT,VOLCANO,FUDGE,CANDY
,HUSK,CORN
21040 DATA PLUTO,PLANET,GYPSY,TRAVELER,HOLY,CHURCH,HUGE,BIG,
INJURY,HURT
21050 DATA MUMPS,ILLNESS,ZERO,NONE,ZINC,METAL,OXYGEN,BREATHE
,DUTY,JOB
21060 DATA EOF,EOF
```

TABLE OF VARIABLES

TL
| 1010 | 1020 | 1030 | 1030 | 1040 | 1040 |
| 1050 | 1120 | 1220 | 1220 | | |

BL
| 1020 | 10010 | 20130 | 20130 | 20140 | 20140 |
| 20150 | 20150 | 20160 | | | |

A$
| 1040 | 1090 | 1100 | 1100 | 1100 | 1100 |
| 1100 | 1100 | 1100 | 1100 | 4100 | 11040 |

B$
| 1040 | 1100 | 4110 | 11080 | 18040 |

FL$
| 1040 | 1060 | 1080 | 1140 | 4020 | 20130 |
| 20130 | | | | | |

HN$
| 1040 | 1080 | 1150 | 16020 | 16030 | 20140 |
| 20140 | | | | | |

C$
| 1040 | 1100 | 4020 | 4050 | 4080 | 4080 |
| 4100 | 15010 | 17030 | | | |

GS$
| 1040 | 1100 | 1100 | 1180 | 18060 | 18060 |
| 18100 | 20070 | 20100 | | | |

NA$
| 1040 | 2110 | 2120 | 12010 | 14020 | 20190 |

S$
1040	1100	4190	4200	11010	11020
11040	11080	14010	17020	17030	18060
20020	20030	20080	20110		

WD$
| 1040 | 1100 | 15010 | 18010 | 18020 | 18040 |
| 18040 | 18080 | 20060 | 20070 | 20080 | 20090 |

FLI$
| 1040 | 1100 | 1130 | 1140 |

HNI$
| 1040 | 1100 | 1130 | 1150 |

I
| 1050 | 1060 | 1070 | 1120 | 1170 | 2010 |
| 2030 | 2050 | 2070 | 2080 | 2090 | 4090 |

```
4100   4100   4100   4110   4120   11030
11040  11040  11050  11080  11080  11090
18030  18040  18040  18050
```

LN
```
1110   1140   1150   1160   1160
```

R
```
4020   4020   10010  16020  16020  16030
16030  20130  20130  20140  20140
```

L
```
4030   4040   4040   4050   4050   4070
4070   4080   4090   11030  18030
```

HT
```
4180   4240   4260   4300   11070  16040
17050  20050
```

TR
```
4250   4250   15030  20040
```

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM    GUESS THE WORD BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM    INITIALIZATION - SET 'TL' TO TOTAL NUMBER OF WORD
S IN YOUR DATA SET.
1010 TL = 20
1020 BL = TL
1030 DIM A$(20),B$(20),FL$(TL),HN$(TL)
1040 FOR I = 1 TO TL
1050 READ FL$(I),HN$(I)
1060 NEXT I
1070 REM USE FULL SCREEN
1080 POKE 82,0
2000 REM    INTRODUCTION
2010 FOR I = 1 TO 12
2020 PRINT
2030 NEXT I
2040 PRINT "      GUESS THE WORD"
2050 FOR I = 1 TO 12
2060 PRINT
2070 NEXT I
2080 FOR I = 1 TO 1000
2090 NEXT I
2100 PRINT "WHAT IS YOUR NAME";
2110 INPUT NA$
2120 PRINT "I AM HAPPY TO MEET YOU, ";NA$;"."
2130 PRINT
2140 PRINT
2150 PRINT
2160 PRINT "I AM GOING TO THINK OF A WORD,"
2170 PRINT "AND IT WILL BE YOUR JOB TO"
2180 PRINT "GUESS IT.  YOU DO THIS BY"
```

```
2190 PRINT "GUESSING ONE LETTER AT A TIME."
2200 PRINT
2210 PRINT "AT ANY TIME YOU CAN TYPE IN"
2220 PRINT "AN '!' AND THEN GUESS THE WHOLE"
2230 PRINT "WORD.  IF YOU NEED A HINT, TYPE"
2240 PRINT "IN A '?' AND I WILL TRY TO HELP YOU."
2250 PRINT
2260 PRINT
2270 PRINT "HERE WE GO!"
2280 PRINT
2290 PRINT
4000 REM   MAIN PROGRAM
4010 GOSUB 10000
4020 C$ = FL$(R)
4030 L =  LEN (C$)
4040 FOR I = 1 TO L
4050 A$(I) =  MID$ (C$,I,1)
4060 B$(I) = "*"
4070 NEXT I
4080 GOSUB 18000
4090 PRINT
4100 PRINT
4110 PRINT
4120 PRINT "GUESS A LETTER (OR '?' OR '!')."
4130 HT = 0
4140 INPUT S$
4150 IF  LEN (S$) = 1 THEN 4180
4160 PRINT "TYPE IN ONLY ONE LETTER!"
4170 GOTO 4140
4180 GOSUB 11000
4190 IF HT = 2 THEN 4120
4200 TR = TR + 1
4210 IF HT = 1 THEN 4250
4220 GOSUB 14000
4230 GOSUB 18000
4240 GOTO 4090
4250 HT = 0
4260 GOSUB 12000
4270 GOSUB 18000
4280 GOSUB 15000
4290 GOTO 4090
10000 REM     RANDOMIZATION
10010 R =  RND(BL)
10020 RETURN
11000 REM  JUDGE ANSWER
11010 IF S$ = "?" THEN 16000
11020 IF S$ = "!" THEN 17000
11030 FOR I = 1 TO L
11040 IF A$(I) = S$ THEN B$(I) = S$
11050 IF A$(I) = S$ THEN HT = 1
11060 NEXT I
11070 RETURN
12000 REM  REWARD
12010 PRINT "GOOD GUESS, ";NA$;"!"
12020 RETURN
14000 REM  WRONG GUESS
14010 PRINT "THERE ARE NO ";S$;"'S IN"
```

```
14020 PRINT "THE WORD, ";NA$;"."
14030 RETURN
15000 REM   SCORE KEEPING
15010 IF WD$ = C$ THEN 15030
15020 RETURN
15030 PRINT "YOU FOUND THE WORD IN ";TR;" TRIES!"
15040 GOTO 20000
16000 REM   HINT
16010 PRINT
16020 PRINT HN$(R)
16030 HN$(R) = "NO MORE HINTS!"
16040 HT = 2
16050 RETURN
17000 REM   SEE IF STUDENT KNOWS WORD
17010 PRINT "WHAT DO YOU THINK THE WORD IS";
17020 INPUT S$
17030 IF S$ = C$ THEN 15030
17040 PRINT "SORRY--KEEP TRYING"
17050 HT = 2
17060 GOTO 14000
18000 REM   PRINT ROUTINE
18010 WD$ = ""
18020 FOR I = 1 TO L
18030 WD$ = WD$ + B$(I)
18040 NEXT I
18050 GS$ = GS$ + S$
18060 PRINT
18070 PRINT WD$
18080 PRINT
18090 PRINT "LETTERS GUESSED: ";GS$
18100 RETURN
20000 REM   CLOSING
20010 PRINT "WOULD YOU LIKE ANOTHER WORD (YES OR NO)";
20020 INPUT S$
20030 IF S$ = "NO" THEN 20170
20040 TR = 0
20050 HT = 0
20060 WD$ = ""
20070 GS$ = ""
20080 S$ = ""
20090 REM   DELETE CORRECT WORD FROM LIST
20100 FL$(R) = FL$(BL)
20110 HN$(R) = HN$(BL)
20120 BL = BL - 1
20130 IF BL = 0 THEN  GOTO 20150
20140 GOTO 4010
20150 PRINT "SORRY! YOU HAVE USED ALL THE"
20160 PRINT "WORDS I KNOW, ";NA$;"!"
20170 END
21000 REM   DATA
21010 DATA   EVENING,DARK,COMPUTER,DIGITAL
21020 DATA   RHYTHM,MUSIC,QUIZ,TEST,LYNX,CAT,KNOCK,TAP,UGLY,M
ONSTER
21030 DATA VULTURE,BIRD,YAWN,MOUTH,ERUPT,VOLCANO,FUDGE,CANDY
,HUSK,CORN
21040 DATA   PLUTO,PLANET,GYPSY,TRAVELER,HOLY,CHURCH,HUGE,BIG
,INJURY,HURT
```

```
21050 DATA   MUMPS,ILLNESS,ZERO,NONE,ZINC,METAL,OXYGEN,BREATH
E,DUTY,JOB
```

TABLE OF VARIABLES

```
A$(*) - WORD BROKEN INTO LETTERS
1030 4050 11040

B$(*) - ARRAY HOLDING *'S OR GUESSED LETTERS
1030 4060 11080 18030

BL - BOTTOM OF LIST
1020 10010 20100 20110 20120
20120 20130

C$ - CORRECT WORD
4020 4030 4050 15010 17030

FL$(*) - WORD LIST
1030 1050 4020 20100 20100

GS$ - LETTERS GUESSED
18050 18050 18090 20070

HN$(*) - HINT LIST
1030 1050 16020 16030 20110
20110

HT - HIT
4130 4190 4210 4250 11070 16040
17050 20050

I - COUNTER
1040 1050 1050 1060 2010 2030
2050 2070 2080 2090 4040 4050
4050 4060 4070 11030 11040
11050 11080 11090 18020 18030
18040

L - LENGTH OF WORD
4030 4040 11030 18020

NA$ - NAME
2110 2120 12010 14020 20160

R - RANDOM NUMBER
4020 10010 16020 16030 20100
20110

S$ - STUDENT ANSWER
4140 4150 11010 11020 11040
11080 14010 17020 17030 18050
20020 20030 20080

TL - NUMBER OF WORDS IN LIST
1010 1020 1030 1030 1040
```

TR — NUMBER OF TRIES
4200 4200 15030 20040

WD$ — ASSEMBLED WORD WITH MISSING LETTERS
15010 18010 18030 18030 18070
20060

END OF VAR. LIST

SAMPLE RUN

WHAT IS YOUR NAME?JENNIFER
I AM HAPPY TO MEET YOU, JENNIFER.

I AM GOING TO THINK OF A WORD,
AND IT WILL BE YOUR JOB TO
GUESS IT. YOU DO THIS BY
GUESSING ONE LETTER AT A TIME.

AT ANY TIME YOU CAN TYPE IN
AN '!' AND THEN GUESS THE WHOLE
WORD. IF YOU NEED A HINT, TYPE
IN A '?' AND I WILL TRY TO HELP YOU.

HERE WE GO!

******

LETTERS GUESSED:

GUESS A LETTER (OR '?' OR '!').
?A
THERE ARE NO A'S IN
THE WORD, JENNIFER.

******

LETTERS GUESSED: A

GUESS A LETTER (OR '?' OR '!').
?E
THERE ARE NO E'S IN
THE WORD, JENNIFER.

******

LETTERS GUESSED: AE

```
GUESS A LETTER (OR '?' OR '!').
?I
THERE ARE NO I'S IN
THE WORD, JENNIFER.

******

LETTERS GUESSED: AEI


GUESS A LETTER (OR '?' OR '!').
?O
THERE ARE NO O'S IN
THE WORD, JENNIFER.

******

LETTERS GUESSED: AEIO


GUESS A LETTER (OR '?' OR '!').
?U
THERE ARE NO U'S IN
THE WORD, JENNIFER.

******

LETTERS GUESSED: AEIOU


GUESS A LETTER (OR '?' OR '!').
?Y
GOOD GUESS, JENNIFER!

**Y***

LETTERS GUESSED: AEIOUY


GUESS A LETTER (OR '?' OR '!').
??

MUSIC
GUESS A LETTER (OR '?' OR '!').
?R
GOOD GUESS, JENNIFER!

R*Y***

LETTERS GUESSED: AEIOUYR
```

```
GUESS A LETTER (OR '?' OR '!').
?!
WHAT DO YOU THINK THE WORD IS?RHYTHM
YOU FOUND THE WORD IN 7 TRIES!
WOULD YOU LIKE ANOTHER WORD (YES OR NO)?NO
```
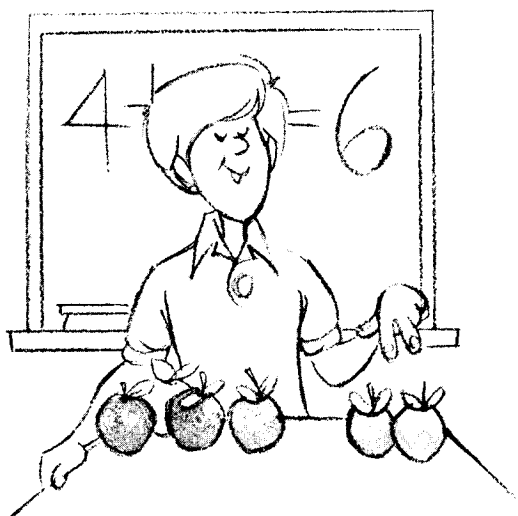
Math Tutor

PROGRAM DESCRIPTION

In this program the computer presents problems on simple addition, subtraction, multiplication, and division. You select the math category you want and the number of problems you want to work in that category. The computer also asks you the largest set of numbers (digits) you want to work with in the category selected, and, in the case of division, the computer allows you to choose whether or not you want to have remainders in your division problems. Correct answers and wrong answers are acknowledged, and, after you have finished the number of problems that you originally selected to decipher, the computer tells you how many problems you did correctly.

PROGRAM NOTES

1. After a pre-set number of wrong answers to a problem, give the correct answer, and then go on to another problem.

2. See if you can come up with a "mixed" selection, where all types of problems will appear at random.

3. If you have a printer, consider saving any "missed" problems during the program. Print these problems out as a "homework" assignment at the end of the program. Three arrays could be set up to cover the two numbers and the arithmetic process (+, −, *, or /).

PROGRAM LISTING: BASIC

```
100 REM MATH TUTOR BY GARY ORWIG
1000 REM INITIALIZE
1010 DIM NA$(50)
1020 DIM SA$(50)
1030 DIM RE$(10)
1040 REM USE FULL SCREEN
1050 POKE 82,0
1060 PRINT
2000 REM INTRODUCTION
2010 PRINT
2020 PRINT "*****************************************"
2030 PRINT
2040 PRINT "                MATH TUTOR"
2050 PRINT
2060 PRINT "*****************************************"
2070 FOR DE=1 TO 1000
2080 NEXT DE
2090 PRINT "WHAT IS YOUR NAME";
2100 INPUT NA$
2110 PRINT
2120 PRINT
2130 PRINT "I AM HAPPY TO MEET YOU, ";NA$;"."
2140 PRINT "WE ARE GOING TO PRACTICE SOME"
2150 PRINT "MATH PROBLEMS."
2160 REM OPERATING PARAMETERS
2170 PRINT
2180 PRINT
2190 PRINT "WOULD YOU LIKE TO PRACTICE"
2200 PRINT "1. ADDITION"
2210 PRINT "2. SUBTRACTION"
2220 PRINT "3. MULTIPLICATION"
2230 PRINT "4. DIVISION"
2240 PRINT
2250 PRINT "(TYPE IN THE NUMBER YOU WANT)"
2260 INPUT SA$
2270 IF SA$="1" THEN 2350
2280 IF SA$="2" THEN 2350
2290 IF SA$="3" THEN 2350
2300 IF SA$="4" THEN 2350
2310 PRINT
2320 PRINT "PLEASE PAY ATTENTION, ";NA$
2330 PRINT "TYPE IN ONLY A 1,2,3, OR 4!"
2340 GOTO 2200
2350 PRINT
2360 PRINT "HOW MANY PROBLEMS DO YOU"
2370 PRINT "WANT, ";NA$;
2380 INPUT NU
2390 PRINT
2400 PRINT "VERY GOOD, ";NU;" IT WILL BE!"
2410 PRINT
2420 PRINT "WHAT IS THE LARGEST NUMBER"
2430 PRINT "YOU WANT TO WORK WITH ";NA$;
2440 INPUT MX
```

```
2450 PRINT
2460 PRINT "GREAT!  I WILL TRY NOT TO GIVE YOU"
2470 PRINT "ANY NUMBERS OVER ";MX;"."
2480 IF SA$="4" THEN 2620
2490 PRINT
2500 PRINT "I AM NOW READY TO START!"
2510 PRINT
2520 FOR DE=1 TO 500
2530 NEXT DE
2540 PRINT "HERE WE GO!!"
2550 FOR DE=1 TO 500
2560 NEXT DE
2570 PRINT
2580 PRINT
2590 PRINT
2600 PRINT
2610 GOTO 4000
2620 PRINT
2630 PRINT "DO YOU WANT DIVISION PROBLEMS"
2640 PRINT "WITH REMAINDERS (YES OR NO)";
2650 INPUT RE$
2660 IF RE$="YES" THEN 2720
2670 IF RE$="NO" THEN 2720
2680 PRINT
2690 PRINT "JUST TYPE A 'YES' OR 'NO' PLEASE"
2700 PRINT
2710 GOTO 2620
2720 GOTO 2490
4000 REM MAIN PROGRAM
4010 IF SA$="1" THEN 4730
4020 IF SA$="2" THEN 4570
4030 IF SA$="3" THEN 4470
4040 IF RE$="YES" THEN 4220
4050 REM DIVISION WITHOUT REMAINDER
4060 GOSUB 10000
4070 HT=1
4080 IF A<B THEN 4110
4090 C=A/B
4100 GOTO 4150
4110 D=B
4120 B=A
4130 A=D
4140 GOTO 4090
4150 IF C-INT(C)>0 THEN 4060
4160 PRINT A;" DIVIDED BY ";B;" EQUALS";
4170 INPUT SA
4180 GOSUB 11000
4190 GOSUB 12000
4200 GOSUB 15000
4210 GOTO 4050
4220 REM DIVISION WITH REMAINDER
4230 GOSUB 10000
4240 HT=1
4250 IF A<B THEN 4290
4260 C=INT(A/B)
4270 RE=A-(C*B)
4280 GOTO 4330
```

```
4290 D=B
4300 B=A
4310 A=D
4320 GOTO 4260
4330 PRINT
4340 PRINT A;" DIVIDED BY ";B;" EQUALS?"
4350 PRINT "WHAT IS THE WHOLE NUMBER";
4360 INPUT SA
4370 GOSUB 11000
4380 GOSUB 12000
4390 PRINT "AND WHAT IS THE REMAINDER?"
4400 PRINT "TYPE IN 0 IF THERE IS NONE."
4410 INPUT SA
4420 C=RE
4430 GOSUB 11000
4440 GOSUB 12000
4450 GOSUB 15000
4460 GOTO 4220
4470 REM MULTIPLICATION
4480 GOSUB 10000
4490 HT=1
4500 C=A*B
4510 PRINT A;" TIMES ";B;" EQUALS";
4520 INPUT SA
4530 GOSUB 11000
4540 GOSUB 12000
4550 GOSUB 15000
4560 GOTO 4470
4570 REM SUBTRACTION
4580 GOSUB 10000
4590 HT=1
4600 IF A<B THEN 4630
4610 C=A-B
4620 GOTO 4670
4630 D=B
4640 B=A
4650 A=D
4660 GOTO 4610
4670 PRINT A;" MINUS ";B;" EQUALS";
4680 INPUT SA
4690 GOSUB 11000
4700 GOSUB 12000
4710 GOSUB 15000
4720 GOTO 4570
4730 REM ADDITION
4740 GOSUB 10000
4750 HT=1
4760 C=A+B
4770 PRINT A;" PLUS ";B;" EQUALS";
4780 INPUT SA
4790 GOSUB 11000
4800 GOSUB 12000
4810 GOSUB 15000
4820 GOTO 4730
10000 REM RANDOMIZING
10010 A=INT(MX*RND(0))+1
10020 B=INT(MX*RND(0))+1
```

```
10030 RETURN
11000 REM JUDGE ANSWER
11010 IF SA=C THEN 11070
11020 GOSUB 14000
11030 PRINT
11040 PRINT "TRY AGAIN!"
11050 INPUT SA
11060 GOTO 11010
11070 RETURN
12000 REM REWARDS
12010 PRINT
12020 I=INT(5*RND(0))+1
12030 ON I GOTO 12050,12070,12090,12110,12130
12040 REM REWARDS
12050 PRINT "GREAT!"
12060 RETURN
12070 PRINT "SUPER!"
12080 RETURN
12090 PRINT "FANTASTIC!"
12100 RETURN
12110 PRINT "YOU'RE REALLY GOING NOW, ";NA$
12120 RETURN
12130 PRINT "THAT'S GREAT, ";NA$
12140 RETURN
14000 REM WRONG
14010 PRINT
14020 IF HT=0 THEN 14050
14030 WR=WR+1
14040 HT=0
14050 I=INT(5*RND(0))+1
14060 ON I GOTO 14080,14100,14120,14140,14160
14070 REM WRONGS
14080 PRINT "OOPS!"
14090 RETURN
14100 PRINT "LOOK CLOSER, ";NA$
14110 RETURN
14120 PRINT "NO...."
14130 RETURN
14140 PRINT "ARE YOU PAYING ATTENTION, ";NA$
14150 RETURN
14160 PRINT "SORRY!"
14170 RETURN
15000 REM SCORE KEEPING
15010 TL=TL+1
15020 IF TL=NU THEN 20000
15030 RETURN
20000 REM CLOSING
20010 PRINT
20020 PRINT "THAT'S ALL!"
20030 PRINT
20040 PRINT "I HOPE YOU HAD FUN, ";NA$
20050 PRINT
20060 PRINT
20070 PRINT
20080 PRINT "YOU HAD ";NU-WR;" OUT OF "
20090 PRINT NU;" PROBLEMS CORRECT!"
20100 END
```

TABLE OF VARIABLES

NA$
1010	2100	2130	2320	2370	2430
12110	12130	14100	14140	20040	

SA$
1020	2260	2270	2280	2290	2300
2480	4010	4020	4030		

RE$
1030	2650	2660	2670	4040

DE
2070	2080	2520	2530	2550	2560

NU
2380	2400	15020	20080	20090

MX
2440	2470	10010	10020

HT
4070	4240	4490	4590	4750	14020
14040					

A
4080	4090	4120	4130	4160	4250
4260	4270	4300	4310	4340	4500
4510	4600	4610	4640	4650	4670
4760	4770	10010			

B
4080	4090	4110	4120	4160	4250
4260	4270	4290	4300	4340	4500
4510	4600	4610	4630	4640	4670
4760	4770	10020			

C
4090	4150	4150	4260	4270	4420
4500	4610	4760	11010		

D
4110	4130	4290	4310	4630	4650

SA
4170	4360	4410	4520	4680	4780
11010	11050				

RE
4270	4420

I
12020	12030	14050	14060

```
WR
   14030  14030  20080

TL
   15010  15010  15020
```

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   MATH TUTOR BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM INITIALIZATION
1010 REM USE FULL SCREEN
1020 POKE 82,0
1030 CLS
2000 REM   INTRODUCTION
2010 PRINT
2020 PRINT "****************************************"
2030 PRINT
2040 PRINT "                    MATH TUTOR"
2050 PRINT
2060 PRINT "****************************************"
2070 FOR DE = 1 TO 1000
2080 NEXT DE
2090 PRINT "WHAT IS YOUR NAME";
2100 INPUT NA$
2110 PRINT
2120 PRINT
2130 PRINT "I AM HAPPY TO MEET YOU, ";NA$;"."
2140 PRINT "WE ARE GOING TO PRACTICE SOME"
2150 PRINT "MATH PROBLEMS."
2160 REM   OPERATING PARAMETERS
2170 PRINT
2180 PRINT
2190 PRINT "WOULD YOU LIKE TO PRACTICE:"
2200 PRINT "1. ADDITION"
2210 PRINT "2. SUBTRACTION"
2220 PRINT "3. MULTIPLICATION"
2230 PRINT "4. DIVISION"
2240 PRINT
2250 PRINT "(TYPE IN THE NUMBER YOU WANT)"
2260 INPUT SA$
2270 IF SA$ = "1" THEN 2350
2280 IF SA$ = "2" THEN 2350
2290 IF SA$ = "3" THEN 2350
2300 IF SA$ = "4" THEN 2350
2310 PRINT
2320 PRINT "PLEASE PAY ATTENTION, "NA$
2330 PRINT "TYPE IN ONLY A 1,2,3, OR 4!"
2340 GOTO 2200
2350 PRINT
2360 PRINT "HOW MANY PROBLEMS DO YOU"
2370 PRINT "WANT, ";NA$;
2380 INPUT NU
2390 PRINT
```

```
2400 PRINT "VERY GOOD, ";NU;" IT WILL BE!"
2410 PRINT
2420 PRINT "WHAT IS THE LARGEST NUMBER"
2430 PRINT "YOU WANT TO WORK WITH ";NA$;
2440 INPUT MX
2450 PRINT
2460 PRINT "GREAT!  I WILL TRY NOT TO GIVE YOU"
2470 PRINT "ANY NUMBERS OVER ";MX;"."
2480 IF SA$ = "4" THEN 2620
2490 PRINT
2500 PRINT "I AM NOW READY TO START!"
2510 PRINT
2520 FOR DE = 1 TO 500
2530 NEXT DE
2540 PRINT "HERE WE GO!!"
2550 FOR DE = 1 TO 500
2560 NEXT DE
2570 PRINT
2580 PRINT
2590 PRINT
2600 PRINT
2610 GOTO 4000
2620 PRINT
2630 PRINT "DO YOU WANT DIVISION PROBLEMS"
2640 PRINT "WITH REMAINDERS (YES OR NO)";
2650 INPUT RE$
2660 IF RE$ = "YES" THEN 2720
2670 IF RE$ = "NO" THEN 2720
2680 PRINT
2690 PRINT "JUST TYPE A 'YES' OR 'NO' PLEASE"
2700 PRINT
2710 GOTO 2620
2720 GOTO 2490
4000 REM  MAIN PROGRAM
4010 IF SA$ = "1" THEN 4730
4020 IF SA$ = "2" THEN 4570
4030 IF SA$ = "3" THEN 4470
4040 IF RE$ = "YES" THEN 4220
4050 REM  DIVISION WITHOUT REMAINDER
4060 GOSUB 10000
4070 HT = 1
4080 IF A<B THEN 4110
4090 C = A/B
4100 GOTO 4150
4110 D=B
4120 B=A
4130 A=D
4140 GOTO 4090
4150 IF C - INT(C) > 0 THEN 4060
4160 PRINT A;" DIVIDED BY ";B;" EQUALS";
4170 INPUT SA
4180 GOSUB 11000
4190 GOSUB 12000
4200 GOSUB 15000
4210 GOTO 4050
4220 REM  DIVISION WITH REMAINDER
```

```
4230 GOSUB 10000
4240 HT = 1
4250 IF A < B THEN 4290
4260 C =   INT (A / B)
4270 RE = A - (C * B)
4280 GOTO 4330
4290 D = B
4300 B = A
4310 A = D
4320 GOTO 4260
4330 PRINT
4340 PRINT A;" DIVIDED BY ";B;" EQUALS?"
4350 PRINT "WHAT IS THE WHOLE NUMBER";
4360 INPUT SA
4370 GOSUB 11000
4380 GOSUB 12000
4390 PRINT "AND WHAT IS THE REMAINDER?"
4400 PRINT "TYPE IN 0 IF THERE IS NONE."
4410 INPUT SA
4420 C = RE
4430 GOSUB 11000
4440 GOSUB 12000
4450 GOSUB 15000
4460 GOTO 4220
4470 REM   MULTIPLICATION
4480 GOSUB 10000
4490 HT = 1
4500 C = A * B
4510 PRINT A;" TIMES ";B;" EQUALS";
4520 INPUT SA
4530 GOSUB 11000
4540 GOSUB 12000
4550 GOSUB 15000
4560 GOTO 4470
4570 REM   SUBTRACTION
4580 GOSUB 10000
4590 HT = 1
4600 IF A < B THEN 4630
4610 C = A - B
4620 GOTO 4670
4630 D = B
4640 B = A
4650 A = D
4660 GOTO 4610
4670 PRINT A;" MINUS ";B;" EQUALS";
4680 INPUT SA
4690 GOSUB 11000
4700 GOSUB 12000
4710 GOSUB 15000
4720 GOTO 4570
4730 REM   ADDITION
4740 GOSUB 10000
4750 HT = 1
4760 C = A + B
4770 PRINT A;" PLUS ";B;" EQUALS";
4780 INPUT SA
```

```
4790 GOSUB 11000
4800 GOSUB 12000
4810 GOSUB 15000
4820 GOTO 4730
10000 REM   RANDOMIZING
10010 A =   RND(MX)
10020 B =   RND(MX)
10030 RETURN
11000 REM   JUDGE ANSWER
11010 IF SA = C THEN 11070
11020 GOSUB 14000
11030 PRINT
11040 PRINT "TRY AGAIN!"
11050 INPUT SA
11060 GOTO 11010
11070 RETURN
12000 REM   REWARDS
12010 PRINT
12020 I =   RND(5)
12030 ON I GOTO 12050,12070,12090,12110,12130
12040 REM   REWARDS
12050 PRINT "GREAT!"
12060 RETURN
12070 PRINT "SUPER!"
12080 RETURN
12090 PRINT "FANTASTIC!"
12100 RETURN
12110 PRINT "YOU'RE REALLY GOING NOW, ";NA$
12120 RETURN
12130 PRINT "THAT'S GREAT, ";NA$
12140 RETURN
14000 REM   WRONG
14010 PRINT
14020 IF HT = 0 THEN 14050
14030 WR = WR + 1
14040 HT = 0
14050 I =   RND(5)
14060 ON I GOTO 14080,14100,14120,14140,14160
14070 REM   WRONGS
14080 PRINT "OOPS!"
14090 RETURN
14100 PRINT "LOOK CLOSER, ";NA$
14110 RETURN
14120 PRINT "NO...."
14130 RETURN
14140 PRINT "ARE YOU PAYING ATTENTION, ";NA$
14150 RETURN
14160 PRINT "SORRY!"
14170 RETURN
15000 REM   SCORE KEEPING
15010 TL = TL + 1
15020 IF TL = NU THEN 20000
15030 RETURN
20000 REM   CLOSING
20010 PRINT
20020 PRINT "THAT'S ALL!"
```

```
20030 PRINT
20040 PRINT "I HOPE YOU HAD FUN, ";NA$
20050 PRINT
20060 PRINT
20070 PRINT
20080 PRINT "YOU HAD ";NU - WR;" OUT OF "
20090 PRINT NU;" PROBLEMS CORRECT!"
20100 END
```

TABLE OF VARIABLES

```
A - ONE OF THE NUMBERS
4080 4090 4120 4130 4160 4250
4260 4270 4300 4310 4340 4500
4510 4600 4610 4640 4650 4670
4760 4770 10010

B - THE OTHER NUMBER
4080 4090 4110 4120 4160 4250
4260 4270 4290 4300 4340 4500
4510 4600 4610 4630 4640 4670
4760 4770 10020

C - CORRECT ANSWER
4090 4150 4150 4260 4270 4420
4500 4610 4760 11010

D - TRANSFER VARIABLE
4110 4130 4290 4310 4630 4650

DE - DELAY
2070 2080 2520 2530 2550 2560

HT - HIT (CORRECT ANSWER)
4070 4240 4490 4590 4750 14020
14040

I - COUNTER
12020 12030 14050 14060

MX - MAXIMUM SIZE OF A AND B
2440 2470 10010 10020

NA$ - NAME
2100 2130 2320 2370 2430 12110
12130 14100 14140 20040

NU - NUMBER OF PROBLEMS
2380 2400 15020 20080 20090

RE - REMAINDER
4270 4420

RE$ - REMAINDER FLAG FOR DIVISION
2650 2660 2670 4040
```

SA — STUDENT ANSWER
4170 4360 4410 4520 4680 4780
11010 11050

SA$ — STUDENT ANSWER
2260 2270 2280 2290 2300 2480
4010 4020 4030

TL — NUMBER OF PROBLEMS PRESENTED
15010 15010 15020

WR — NUMBER WRONG
14030 14030 20080

END OF VAR. LIST

SAMPLE RUN

WHAT IS YOUR NAME?RONDA

I AM HAPPY TO MEET YOU, RONDA.
WE ARE GOING TO PRACTICE SOME
MATH PROBLEMS.

WOULD YOU LIKE TO PRACTICE:
1. ADDITION
2. SUBTRACTION
3. MULTIPLICATION
4. DIVISION

(TYPE IN THE NUMBER YOU WANT)
?4

HOW MANY PROBLEMS DO YOU
WANT, RONDA?4

VERY GOOD, 4 IT WILL BE!

WHAT IS THE LARGEST NUMBER
YOU WANT TO WORK WITH RONDA?25

GREAT! I WILL TRY NOT TO GIVE YOU
ANY NUMBERS OVER 25.

DO YOU WANT DIVISION PROBLEMS
WITH REMAINDERS (YES OR NO)?NO

I AM NOW READY TO START!

HERE WE GO!!

```
23 DIVIDED BY 1 EQUALS?23

THAT'S GREAT, RONDA
11 DIVIDED BY 1 EQUALS?11

FANTASTIC!
20 DIVIDED BY 1 EQUALS?20

THAT'S GREAT, RONDA
10 DIVIDED BY 2 EQUALS?2

LOOK CLOSER, RONDA

TRY AGAIN!
?5

THAT'S GREAT, RONDA

THAT'S ALL!

I HOPE YOU HAD FUN, RONDA


YOU HAD 3 OUT OF
4 PROBLEMS CORRECT!
```
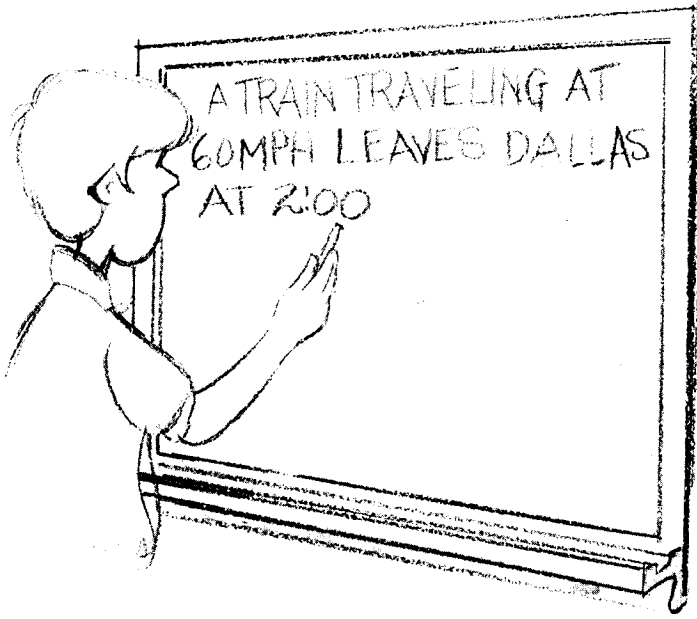
Math Word Problems

PROGRAM DESCRIPTION

Word problems in math are presented in this program. The computer displays a word problem and, if you don't want to work that particular problem, you have the option of receiving a new and different problem by entering a "0" into the computer. When giving the answer to a problem use only numbers, not such units as $, liters, or other words.

PROGRAM NOTES

1. Consider providing the answer after a certain number of wrong guesses.

2. You can enter your own problems in place of the ones that are there. Start each problem with the correct answer, and use several lines to enter the problem. End each problem with a RETURN command. Be sure to maintain the proper sequence of line numbers to start each problem.

PROGRAM LISTING: BASIC

```
100 REM MATH WORD PROBLEMS BY GARY ORWIG
1000 REM INITIALIZATION - MAKE 'TL' EQUAL TO THE NUMBER OF P
ROBLEMS IN YOUR DATA STATEMENTS
1010 TL=10
1020 DIM C(TL)
1030 FOR I=1 TO TL
1040 C(I)=0
```

```
1050 NEXT I
1060 DIM NA$(30)
1070 DIM SA$(15)
1080 REM USE FULL SCREEN
1090 POKE 82,0
1100 PRINT
2000 REM INTRODUCTION
2010 D=5
2020 L=24
2030 GOSUB 18000
2040 FOR J=1 TO 30
2050 PRINT "MATH"
2060 GOSUB 19000
2070 NEXT J
2080 FOR J=1 TO 30
2090 PRINT "        WORD"
2100 GOSUB 19000
2110 NEXT J
2120 FOR J=1 TO 30
2130 PRINT "                PROBLEMS"
2140 GOSUB 19000
2150 NEXT J
2160 D=200
2170 GOSUB 19000
2180 L=24
2190 GOSUB 18000
2200 PRINT "HI!  I'M GLAD TO SEE YOU."
2210 PRINT "WHAT IS YOUR NAME?"
2220 L=11
2230 GOSUB 18000
2240 INPUT NA$
2250 L=12
2260 GOSUB 18000
2270 PRINT "I'M HAPPY TO MEET YOU, ";NA$;"."
2280 PRINT "I AM GOING TO GIVE YOU SOME WORD"
2290 PRINT "PROBLEMS.  IF YOU DON'T WANT TO TRY"
2300 PRINT "ANY PARTICULAR PROBLEM, TYPE IN A '0'"
2310 PRINT "FOR THE ANSWER AND I WILL GIVE YOU "
2320 PRINT "ANOTHER.   "
2330 PRINT
2340 PRINT "WHEN YOU TYPE IN AN ANSWER, TYPE IN"
2350 PRINT "ONLY THE NUMBER (DON'T TYPE IN"
2360 PRINT "'$', LITERS, OR OTHER WORDS)."
2370 PRINT
2380 PRINT "PUSH THE 'RETURN' KEY"
2390 PRINT "WHEN YOU ARE READY TO START."
2400 L=6
2410 GOSUB 18000
2420 INPUT SA$
4000 REM MAIN PROGRAM
4010 WR=0
4020 FOR I=1 TO TL
4030 IF C(I)=0 THEN GOTO 4060
4040 NEXT I
4050 GOTO 20120
4060 GOSUB 10000
```

```
4070 IF C(R)=1 THEN 4060
4080 C(R)=1
4090 L=24
4100 GOSUB 18000
4110 ON R GOSUB 21000,21050,21100,21150,21200,21250,21300,21
350,21400,21450
4120 L=10
4130 GOSUB 18000
4140 INPUT SA
4150 GOSUB 11000
4160 ON HT GOTO 4200,4170,4000
4170 GOSUB 12000
4180 GOSUB 15000
4190 GOTO 4000
4200 GOSUB 14000
4210 GOSUB 15000
4220 GOTO 4090
10000 REM RANDOMIZATION
10010 R=INT(RND(0)*TL)+1
10020 RETURN
11000 REM JUDGE ANSWER
11010 IF SA=0 THEN 11070
11020 IF SA=C THEN 11050
11030 HT=1
11040 RETURN
11050 HT=2
11060 RETURN
11070 HT=3
11080 RETURN
12000 REM REWARD
12010 L=24
12020 GOSUB 18000
12030 PRINT "              VERY GOOD!"
12040 L=12
12050 GOSUB 18000
12060 D=500
12070 GOSUB 19000
12080 RETURN
14000 REM WRONG
14010 L=24
14020 GOSUB 18000
14030 PRINT "              SORRY!"
14040 L=12
14050 GOSUB 18000
14060 D=500
14070 GOSUB 19000
14080 RETURN
15000 REM SCORE KEEPING
15010 IF HT=1 THEN 15030
15020 GOTO 20000
15030 WR=WR+1
15040 RETURN
18000 REM SCROLLING
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
```

```
18040 RETURN
19000 REM DELAY
19010 FOR I=1 TO D
19020 NEXT I
19030 RETURN
20000 REM CLOSING
20010 IF WR=0 THEN 20050
20020 PRINT "IT TOOK ";WR+1;" TRIES TO GET THIS"
20030 PRINT "PROBLEM RIGHT, ";NA$;"."
20040 GOTO 20060
20050 PRINT "YOU GOT IT ON THE FIRST TRY, ";NA$;"!"
20060 PRINT "DO YOU WANT ANOTHER PROBLEM?"
20070 INPUT SA$
20080 IF SA$="NO" THEN 20100
20090 GOTO 4000
20100 PRINT "BYE FOR NOW"
20110 END
20120 PRINT "SORRY, I'M OUT OF PROBLEMS."
20130 END
21000 REM PROBLEM SUBROUTINES
21010 C=244.2
21020 PRINT "MR. JONES AVERAGES 22.2 MILES PER GAL."
21030 PRINT "OF GAS. HOW FAR CAN HE GO ON 11 GALLONS?"
21040 RETURN
21050 C=9
21060 PRINT "JANE EARNS $1.25 AN HOUR MOWING THE"
21070 PRINT "LAWN.  HOW MANY HOURS DID SHE WORK"
21080 PRINT "TO EARN $11.25?"
21090 RETURN
21100 C=5
21110 PRINT "HOW MANY WHOLE BOXES OF ICE CREAM BARS"
21120 PRINT "CAN BE BOUGHT FOR $3.75, IF "
21130 PRINT "EACH BOX COSTS $.69"
21140 RETURN
21150 C=8
21160 PRINT "JANICE HAS SAVED 3 QUARTERS EACH WEEK"
21170 PRINT "FOR 3 WEEKS.  FOR HOW MANY MORE WEEKS"
21180 PRINT "MUST SHE SAVE TO BUY AN $8.25 ALBUM?"
21190 RETURN
21200 C=30
21210 PRINT "DICK SPELLED 70% OF 100 WORDS"
21220 PRINT "CORRECTLY.  HOW MANY WORDS DID HE"
21230 PRINT "MISS?"
21240 RETURN
21250 C=10.5
21260 PRINT "MARTHA BOUGHT SOME JEANS WHICH WERE 25%"
21270 PRINT "OFF THE MARKED PRICE OF $14.00."
21280 PRINT "HOW MUCH DID SHE PAY?"
21290 RETURN
21300 C=10
21310 PRINT "A PUNCH RECIPE CALLS FOR 5 PARTS GRAPE"
21320 PRINT "JUICE TO 2 PARTS GINGER ALE.  HOW MUCH"
21330 PRINT "ALE GOES WITH 25 LITERS OF GRAPE JUICE?"
21340 RETURN
21350 C=24
21360 PRINT "25% OF A CLASS OF 32 STUDENTS WERE"
```

```
21370 PRINT "ABSENT.  HOW MANY STUDENTS WERE "
21380 PRINT "IN CLASS?"
21390 RETURN
21400 C=132
21410 PRINT "A MARCHING BAND HAS 22 ROWS WITH"
21420 PRINT "6 PEOPLE IN EACH ROW.  HOW"
21430 PRINT "MANY PEOPLE DOES THIS MAKE?"
21440 RETURN
21450 C=72
21460 PRINT "A FERRIS WHEEL HAS 24 CARS.  EACH"
21470 PRINT "CAN HOLD 3 PEOPLE.  WHAT IS THE"
21480 PRINT "MAXIMUM CAPACITY OF THE FERRIS WHEEL?"
21490 RETURN
```

TABLE OF VARIABLES

TL
  1010   1020   1030   4020   10010

C(
  1020   1040   4030   4070   4080

I
  1030   1040   1050   4020   4030   4040
  18010   18030   19010   19020

NA$
  1060   2240   2270   20030   20050

SA$
  1070   2420   20070   20080

D
  2010   2160   12060   14060   19010

L
  2020   2180   2220   2250   2400   4090
  4120   12010   12040   14010   14040   18010

J
  2040   2070   2080   2110   2120   2150

WR
  4010   15030   15030   20010   20020

R
  4070   4080   4110   10010

SA
  4140   11010   11020

HT
  4160   11030   11050   11070   15010

C
```
11020 21010 21050 21100 21150 21200
21250 21300 21350 21400 21450
```

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM    MATH WORD PROBLEMS BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM   INITIALIZATION - MAKE 'TL' EQUAL TO THE NUMBER OF
PROBLEMS IN YOUR DATA STATEMENTS
1010 TL = 10
1020 DIM C(TL)
1030 FOR I = 1 TO TL
1040 C(I) = 0
1050 NEXT I
1060 REM USE FULL SCREEN
1070 POKE 82,0
2000 REM   INTRODUCTION
2010 D = 25
2020 L = 24
2030 GOSUB 18000
2040 FOR J = 1 TO 30
2050 PRINT "MATH"
2060 GOSUB 19000
2070 NEXT J
2080 FOR J = 1 TO 30
2090 PRINT "        WORD"
2100 GOSUB 19000
2110 NEXT J
2120 FOR J = 1 TO 30
2130 PRINT "               PROBLEMS"
2140 GOSUB 19000
2150 NEXT J
2160 D = 1000
2170 GOSUB 19000
2180 L = 24
2190 GOSUB 18000
2200 PRINT "HI!  I'M GLAD TO SEE YOU."
2210 PRINT "WHAT IS YOUR NAME?"
2220 L = 11
2230 GOSUB 18000
2240 INPUT NA$
2250 L = 12
2260 GOSUB 18000
2270 PRINT "I'M HAPPY TO MEET YOU, ";NA$;"."
2280 PRINT "I AM GOING TO GIVE YOU SOME WORD"
2290 PRINT "PROBLEMS.  IF YOU DON'T WANT TO TRY"
2300 PRINT "ANY PARTICULAR PROBLEM, TYPE IN A '0'"
2310 PRINT "FOR THE ANSWER AND I WILL GIVE YOU "
2320 PRINT "ANOTHER.  "
2330 PRINT
2340 PRINT "WHEN YOU TYPE IN AN ANSWER, TYPE IN"
2350 PRINT "ONLY THE NUMBER (DON'T TYPE IN"
2360 PRINT "'$', LITERS, OR OTHER WORDS)."
```

```
2370 PRINT
2380 PRINT "PUSH THE 'RETURN' KEY"
2390 PRINT "WHEN YOU ARE READY TO START."
2400 L = 6
2410 GOSUB 18000
2420 INPUT SA$
4000 REM  MAIN PROGRAM
4010 WR = 0
4020 FOR I = 1 TO TL
4030 IF C(I) = 0 THEN  GOTO 4060
4040 NEXT I
4050 GOTO 20120
4060 GOSUB 10000
4070 IF C(R) = 1 THEN 4060
4080 C(R) = 1
4090 L = 24
4100 GOSUB 18000
4110 ON R GOSUB 21000,21050,21100,21150,21200,21250,21300,21
350,21400,21450
4120 L = 10
4130 GOSUB 18000
4140 INPUT SA
4150 GOSUB 11000
4160 ON HT GOTO 4200,4170,4000
4170 GOSUB 12000
4180 GOSUB 15000
4190 GOTO 4000
4200 GOSUB 14000
4210 GOSUB 15000
4220 GOTO 4090
10000 REM   RANDOMIZATION
10010 R =   RND(TL)
10020 RETURN
11000 REM  JUDGE ANSWER
11010 IF SA = 0 THEN 11070
11020 IF SA = C THEN 11050
11030 HT = 1
11040 RETURN
11050 HT = 2
11060 RETURN
11070 HT = 3
11080 RETURN
12000 REM  REWARD
12010 L = 24
12020 GOSUB 18000
12030 PRINT "             VERY GOOD!"
12040 L = 12
12050 GOSUB 18000
12060 D = 500
12070 GOSUB 19000
12080 RETURN
14000 REM  WRONG
14010 L = 24
14020 GOSUB 18000
14030 PRINT "             SORRY!"
14040 L = 12
```

```
14050 GOSUB 18000
14060 D = 500
14070 GOSUB 19000
14080 RETURN
15000 REM   SCORE KEEPING
15010 IF HT = 1 THEN 15030
15020 GOTO 20000
15030 WR = WR + 1
15040 RETURN
18000 REM   SCROLLING
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM   DELAY
19010 FOR I = 1 TO D
19020 NEXT I
19030 RETURN
20000 REM   CLOSING
20010 IF WR = 0 THEN 20050
20020 PRINT "IT TOOK ";WR + 1;" TRIES TO GET THIS"
20030 PRINT "PROBLEM RIGHT, ";NA$;"."
20040 GOTO 20060
20050 PRINT "YOU GOT IT ON THE FIRST TRY, ";NA$;"!"
20060 PRINT "DO YOU WANT ANOTHER PROBLEM?"
20070 INPUT SA$
20080 IF SA$ = "NO" THEN 20100
20090 GOTO 4000
20100 PRINT "BYE FOR NOW"
20110 END
20120 PRINT "SORRY, I'M OUT OF PROBLEMS."
20130 END
21000 REM   PROBLEM SUBROUTINES
21010 C = 244.2
21020 PRINT "MR. JONES AVERAGES 22.2 MILES PER GAL."
21030 PRINT "OF GAS. HOW FAR CAN HE GO ON 11 GALLONS?"
21040 RETURN
21050 C = 9
21060 PRINT "JANE EARNS $1.25 AN HOUR MOWING THE"
21070 PRINT "LAWN.  HOW MANY HOURS DID SHE WORK"
21080 PRINT "TO EARN $11.25?"
21090 RETURN
21100 C = 5
21110 PRINT "HOW MANY WHOLE BOXES OF ICE CREAM BARS"
21120 PRINT "CAN BE BOUGHT FOR $3.75, IF "
21130 PRINT "EACH BOX COSTS $.69
21140 RETURN
21150 C = 8
21160 PRINT "JANICE HAS SAVED 3 QUARTERS EACH WEEK"
21170 PRINT "FOR 3 WEEKS.  FOR HOW MANY MORE WEEKS"
21180 PRINT "MUST SHE SAVE TO BUY AN $8.25 ALBUM?"
21190 RETURN
21200 C = 30
21210 PRINT "DICK SPELLED 70% OF 100 WORDS"
21220 PRINT "CORRECTLY.  HOW MANY WORDS DID HE"
21230 PRINT "MISS?"
```

```
21240 RETURN
21250 C = 10.50
21260 PRINT "MARTHA BOUGHT SOME JEANS WHICH WERE 25%"
21270 PRINT "OFF THE MARKED PRICE OF $14.00."
21280 PRINT "HOW MUCH DID SHE PAY?"
21290 RETURN
21300 C = 10
21310 PRINT "A PUNCH RECIPE CALLS FOR 5 PARTS GRAPE"
21320 PRINT "JUICE TO 2 PARTS GINGER ALE.  HOW MUCH"
21330 PRINT "ALE GOES WITH 25 LITERS OF GRAPE JUICE?"
21340 RETURN
21350 C = 24
21360 PRINT "25% OF A CLASS OF 32 STUDENTS WERE"
21370 PRINT "ABSENT.  HOW MANY STUDENTS WERE "
21380 PRINT "IN CLASS?"
21390 RETURN
21400 C = 132
21410 PRINT "A MARCHING BAND HAS 22 ROWS WITH"
21420 PRINT "6 PEOPLE IN EACH ROW.  HOW"
21430 PRINT "MANY PEOPLE DOES THIS MAKE?"
21440 RETURN
21450 C = 72
21460 PRINT "A FERRIS WHEEL HAS 24 CARS.  EACH"
21470 PRINT "CAN HOLD 3 PEOPLE.  WHAT IS THE"
21480 PRINT "MAXIMUM CAPACITY OF THE FERRIS WHEEL?"
21490 RETURN
```

TABLE OF VARIABLES

```
C - CORRECT ANSWER
11020 21010 21050 21100 21150
21200 21250 21300 21350 21400
21450

C(*) - PROBLEMS ANSWERED CORRECTLY
1020 1040 4030 4070 4080

D - DELAY
2010 2160 12060 14060 19010

HT - HIT
4160 11030 11050 11070 15010

I - COUNTER
1030 1040 1050 4020 4030 4040
18010 18030 19010 19020

J - COUNTER
2040 2070 2080 2110 2120 2150

L - LINES FOR SCROLLING
2020 2180 2220 2250 2400 4090
4120 12010 12040 14010 14040
18010
```

NA$ - NAME
2240 2270 20030 20050

R - RANDOM NUMBER
4070 4080 4110 10010

SA - STUDENT ANSWER
4140 11010 11020

SA$ - STUDENT ANSWER
2420 20070 20080

TL - NUMBER OF PROBLEMS
1010 1020 1030 4020 10010

WR - NUMBER OF TRIES
4010 15030 15030 20010 20020

END OF VAR. LIST

SAMPLE RUN

HI! I'M GLAD TO SEE YOU.
WHAT IS YOUR NAME?

?BILL

I'M HAPPY TO MEET YOU, BILL.
I AM GOING TO GIVE YOU SOME WORD
PROBLEMS. IF YOU DON'T WANT TO TRY
ANY PARTICULAR PROBLEM, TYPE IN A 'O'
FOR THE ANSWER AND I WILL GIVE YOU
ANOTHER.

WHEN YOU TYPE IN AN ANSWER, TYPE IN
ONLY THE NUMBER (DON'T TYPE IN
'$', LITERS, OR OTHER WORDS).

PUSH THE 'RETURN' KEY
WHEN YOU ARE READY TO START.

?

DICK SPELLED 70% OF 100 WORDS
CORRECTLY. HOW MANY WORDS DID HE
MISS?

?30

VERY GOOD!

```
YOU GOT IT ON THE FIRST TRY, BILL!
DO YOU WANT ANOTHER PROBLEM?
?YES


JANICE HAS SAVED 3 QUARTERS EACH WEEK
FOR 3 WEEKS.  FOR HOW MANY MORE WEEKS
MUST SHE SAVE TO BUY AN $8.25 ALBUM?


?11


        SORRY!



JANICE HAS SAVED 3 QUARTERS EACH WEEK
FOR 3 WEEKS.  FOR HOW MANY MORE WEEKS
MUST SHE SAVE TO BUY AN $8.25 ALBUM?


?8


        VERY GOOD!


IT TOOK 2 TRIES TO GET THIS
PROBLEM RIGHT, BILL.
DO YOU WANT ANOTHER PROBLEM?
?NO
BYE FOR NOW
```

Memory Test— Letters

PROGRAM DESCRIPTION

This program enables you to test the power of your memory. The computer rapidly scrolls letters randomly at different time intervals and you try to remember the letters for the correct answer. You may choose at which time interval (short, medium, or long) you want the computer to display the letters, depending on the skill level that you feel is most comfortable. The more you guess correctly, the more difficult the memory test becomes. Each time you answer correctly, the computer increases the letters in the series scrolled.

PROGRAM NOTES

This program is very much like the MEMORY TEST— NUMBERS program. Consider combining them, with an option for presenting numbers, letters, or a mixture.

PROGRAM LISTING: BASIC

```
100 REM MEMORY TEST-LETTERS BY GARY ORWIG
1000 REM INITIALIZATION
1010 DIM A$(3)
1020 DIM AB$(60)
1030 DIM NA$(30)
1040 DIM SA$(60)
1050 REM USE FULL SCREEN
1060 POKE 82,0
```

```
1070 PRINT
2000 REM INTRODUCTION
2010 FOR I=1 TO 40
2020 GOSUB 10000
2030 PRINT AB$
2040 NEXT I
2050 FOR I=1 TO 200
2060 NEXT I
2070 FOR I=1 TO 12
2080 PRINT
2090 NEXT I
2100 PRINT "          MEMORY TEST - LETTERS"
2110 FOR I=1 TO 12
2120 PRINT
2130 NEXT I
2140 PRINT "HI!  I AM A FRIENDLY COMPUTER!"
2150 PRINT "WHAT IS YOUR NAME";
2160 INPUT NA$
2170 PRINT
2180 PRINT
2190 PRINT "IT'S NICE TO MEET YOU, ";NA$;"."
2200 PRINT
2210 PRINT
2220 PRINT "THIS IS A GAME DESIGNED TO TEST"
2230 PRINT "YOUR MEMORY FOR LETTERS."
2240 PRINT
2250 PRINT "I WILL SHOW YOU SOME LETTERS"
2260 PRINT "AND YOU WILL"
2270 PRINT "TRY TO REMEMBER THEM LONG ENOUGH"
2280 PRINT "TO TYPE THEM BACK TO ME."
2290 PRINT
2300 PRINT
2310 PRINT "I CAN SHOW YOU THE LETTERS FOR:"
2320 PRINT
2330 PRINT "1. A SHORT TIME"
2340 PRINT "2. A MEDIUM TIME"
2350 PRINT "3. A LONG TIME"
2360 PRINT
2370 PRINT
2380 PRINT "WHICH DO YOU WANT (1, 2, OR 3)"
2390 PRINT "YOU CAN USE A DECIMAL (LIKE.5)"
2400 PRINT "OR A LARGER NUMBER IF YOU WANT."
2410 INPUT T
2420 T=T*50
2430 FOR I=1 TO 12
2440 PRINT
2450 NEXT I
2460 PRINT "OK!  HERE WE GO!"
2470 AB$=""
2480 FOR I=1 TO 12
2490 PRINT
2500 NEXT I
2510 FOR I=1 TO 200
2520 NEXT I
4000 REM MAIN PROGRAM
4010 GOSUB 10000
```

```
4020 FOR I=1 TO 25
4030 PRINT
4040 NEXT I
4050 PRINT AB$
4060 FOR I=1 TO T
4070 NEXT I
4080 FOR I=1 TO 25
4090 PRINT
4100 NEXT I
4110 PRINT "WHAT WAS THE LETTER SET?"
4120 INPUT SA$
4130 GOSUB 11000
4140 IF HT=0 THEN 4180
4150 GOSUB 12000
4160 GOSUB 15000
4170 GOTO 4010
4180 GOSUB 14000
4190 GOTO 20000
10000 REM RANDOMIZATION
10010 A=INT(RND(0)*26)+65
10020 A$=CHR$(A)
10030 AB$(LEN(AB$)+1)=A$
10040 RETURN
11000 REM JUDGE ANSWER
11010 IF SA$=AB$ THEN GOTO 11040
11020 HT=0
11030 RETURN
11040 HT=1
11050 RETURN
12000 REM REWARDS
12010 HT=0
12020 PRINT "GREAT!"
12030 FOR I=1 TO 250
12040 NEXT I
12050 RETURN
14000 REM WRONG
14010 FOR I=1 TO 12
14020 PRINT
14030 NEXT I
14040 PRINT "SORRY!"
14050 FOR I=1 TO 10
14060 PRINT
14070 NEXT I
14080 RETURN
15000 REM SCORE KEEPING
15010 C=C+1
15020 RETURN
20000 REM CLOSING
20010 PRINT "YOUR ANSWER WAS:"
20020 PRINT SA$
20030 PRINT
20040 PRINT "THE CORRECT LETTER SET WAS:"
20050 PRINT AB$
20060 PRINT
20070 PRINT
20080 PRINT "YOU REMEMBERED A SET"
```

```
20090 PRINT C;" LETTERS LONG!"
20100 PRINT "DO YOU WANT TO TRY AGAIN?"
20110 PRINT "(YES OR NO)";
20120 INPUT SA$
20130 IF SA$="YES" THEN 20160
20140 PRINT "BYE FOR NOW!"
20150 END
20160 SA$=""
20170 AB$=""
20180 C=0
20190 GOTO 2290
```

TABLE OF VARIABLES

A$

| 1010 | 10020 | 10030 |

AB$

| 1020 | 2030 | 2470 | 4050 | 10030 | 10030 |
| 11010 | 20050 | 20170 | | | |

NA$

| 1030 | 2160 | 2190 |

SA$

| 1040 | 4120 | 11010 | 20020 | 20120 | 20130 |
| 20160 | | | | | |

I

2010	2040	2050	2060	2070	2090
2110	2130	2430	2450	2480	2500
2510	2520	4020	4040	4060	4070
4080	4100	12030	12040	14010	14030
14050	14070				

T

| 2410 | 2420 | 2420 | 4060 |

HT

| 4140 | 11020 | 11040 | 12010 |

A

| 10010 | 10020 |

C

| 15010 | 15010 | 20090 | 20180 |

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   MEMORY TEST-LETTERS BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM INITIALIZE
1010 REM USE FULL SCREEN
```

```
1020 POKE 82,0
1030 CLS
2000 REM   INTRODUCTION
2010 FOR I = 1 TO 40
2020 GOSUB 10000
2030 PRINT AB$
2040 NEXT I
2050 FOR I = 1 TO 2000
2060 NEXT I
2070 FOR I = 1 TO 12
2080 PRINT
2090 NEXT I
2100 PRINT "       MEMORY TEST - LETTERS"
2110 FOR I = 1 TO 12
2120 PRINT
2130 NEXT I
2140 PRINT "HI!  I AM A FRIENDLY COMPUTER!"
2150 PRINT "WHAT IS YOUR NAME";
2160 INPUT NA$
2170 PRINT
2180 PRINT
2190 PRINT "IT'S NICE TO MEET YOU, ";NA$;"."
2200 PRINT
2210 PRINT
2220 PRINT "THIS IS A GAME DESIGNED TO TEST"
2230 PRINT "YOUR MEMORY FOR LETTERS."
2240 PRINT
2250 PRINT "I WILL SHOW YOU SOME LETTERS"
2260 PRINT "AND YOU WILL"
2270 PRINT "TRY TO REMEMBER THEM LONG ENOUGH"
2280 PRINT "TO TYPE THEM BACK TO ME."
2290 PRINT
2300 PRINT
2310 PRINT "I CAN SHOW YOU THE LETTERS FOR:"
2320 PRINT
2330 PRINT "1. A SHORT TIME"
2340 PRINT "2. A MEDIUM TIME"
2350 PRINT "3. A LONG TIME"
2360 PRINT
2370 PRINT
2380 PRINT "WHICH DO YOU WANT (1, 2, OR 3)"
2390 PRINT "YOU CAN USE A DECIMAL (LIKE.5)"
2400 PRINT "OR A LARGER NUMBER IF YOU WANT."
2410 INPUT T
2420 T = T * 200
2430 FOR I = 1 TO 12
2440 PRINT
2450 NEXT I
2460 PRINT "OK!  HERE WE GO!"
2470 AB$ = ""
2480 FOR I = 1 TO 12
2490 PRINT
2500 NEXT I
2510 FOR I = 1 TO 2000
2520 NEXT I
4000 REM   MAIN PROGRAM
```

```
4010 GOSUB 10000
4020 FOR I = 1 TO 25
4030 PRINT
4040 NEXT I
4050 PRINT AB$
4060 FOR I = 1 TO T
4070 NEXT I
4080 FOR I = 1 TO 25
4090 PRINT
4100 NEXT I
4110 PRINT "WHAT WAS THE LETTER SET?"
4120 INPUT SA$
4130 GOSUB 11000
4140 IF HT = 0 THEN 4180
4150 GOSUB 12000
4160 GOSUB 15000
4170 GOTO 4010
4180 GOSUB 14000
4190 GOTO 20000
10000 REM      RANDOMIZATION
10010 A =   RND(26)+65
10020 A$ =   CHR$ (A)
10030 AB$ = AB$ + A$
10040 RETURN
11000 REM   JUDGE ANSWER
11010 IF SA$ = AB$ GOTO 11040
11020 HT = 0
11030 RETURN
11040 HT = 1
11050 RETURN
12000 REM   REWARDS
12010 HT = 0
12020 PRINT "GREAT!"
12030 FOR I = 1 TO 1000
12040 NEXT I
12050 RETURN
14000 REM   WRONG
14010 FOR I = 1 TO 12
14020 PRINT
14030 NEXT I
14040 PRINT "SORRY!"
14050 FOR I = 1 TO 10
14060 PRINT
14070 NEXT I
14080 RETURN
15000 REM   SCORE KEEPING
15010 C = C + 1
15020 RETURN
20000 REM   CLOSING
20010 PRINT "YOUR ANSWER WAS:"
20020 PRINT SA$
20030 PRINT
20040 PRINT "THE CORRECT LETTER SET WAS:"
20050 PRINT AB$
20060 PRINT
20070 PRINT
```

```
20080 PRINT "YOU REMEMBERED A SET"
20090 PRINT C;" LETTERS LONG!"
20100 PRINT "DO YOU WANT TO TRY AGAIN?"
20110 PRINT "(YES OR NO)";
20120 INPUT SA$
20130 IF SA$ = "YES" THEN 20160
20140 PRINT "BYE FOR NOW!"
20150 END
20160 SA$ = ""
20170 AB$ = ""
20180 C = 0
20190 GOTO 2290
```

TABLE OF VARIABLES

```
A - RANDOM NUMBER
10010 10020

A$ - RANDOM LETTER
10020 10030

AB$ - RANDOM LETTER STRING
2030 2470 4050 10030 10030
11010 20050 20170

C - LENGTH OF STRING
15010 15010 20090 20180

HT - HIT
4140 11020 11040 12010

I - COUNTER
2010 2040 2050 2060 2070 2090
2110 2130 2430 2450 2480 2500
2510 2520 4020 4040 4060 4070
4080 4100 12030 12040 14010
14030 14050 14070

NA$ - NAME
2160 2190

SA$ - STUDENT ANSWER
4120 11010 20020 20120 20130
20160

T - DELAY
2410 2420 2420 4060

END OF VAR. LIST
```

SAMPLE RUN

```
HI!  I AM A FRIENDLY COMPUTER!
WHAT IS YOUR NAME?MICKEY
```

IT'S NICE TO MEET YOU, MICKEY.

THIS IS A GAME DESIGNED TO TEST
YOUR MEMORY FOR LETTERS.

I WILL SHOW YOU SOME LETTERS
AND YOU WILL
TRY TO REMEMBER THEM LONG ENOUGH
TO TYPE THEM BACK TO ME.

I CAN SHOW YOU THE LETTERS FOR:

1. A SHORT TIME
2. A MEDIUM TIME
3. A LONG TIME

WHICH DO YOU WANT (1, 2, OR 3)
YOU CAN USE A DECIMAL (LIKE.5)
OR A LARGER NUMBER IF YOU WANT.
?1

OK! HERE WE GO!

W

WHAT WAS THE LETTER SET?
?W
GREAT!

WY

WHAT WAS THE LETTER SET?
?WY
GREAT!

WYO

WHAT WAS THE LETTER SET?
?WYO
GREAT!

WYOA

```
WHAT WAS THE LETTER SET?
?WYOA
GREAT!


WYOAZ


WHAT WAS THE LETTER SET?
?WYOAZ
GREAT!


WYOAZR


WHAT WAS THE LETTER SET?
?WYOAZR
GREAT!


WYOAZRX


WHAT WAS THE LETTER SET?
?WYOAZRX
GREAT!


WYOAZRXG


WHAT WAS THE LETTER SET?
?WTAOZRXG


SORRY!


YOUR ANSWER WAS:
WTAOZRXG

THE CORRECT LETTER SET WAS:
WYOAZRXG


YOU REMEMBERED A SET
7 LETTERS LONG!
DO YOU WANT TO TRY AGAIN?
(YES OR NO)?NO
BYE FOR NOW!
```

Memory Test— Numbers

PROGRAM DESCRIPTION

This program is very similar to MEMORY TEST—LETTERS, except that it is easier to perform. The computer rapidly scrolls numbers randomly at different time intervals and you try to remember the numbers for the correct answer. You may choose at which time interval (short, medium, or long) you want the computer to display the numbers, depending on the skill level that you feel is most comfortable. Again, as in MEMORY TEST— LETTERS, the more you guess correctly, the more difficult the memory test becomes. Each time you answer correctly, the computer increases the digits in the number scrolled.

PROGRAM NOTES

1. The scrolling process can be built into a subroutine of its own. See line 18000 of some of the other programs.

2. Consider "flashing" the numbers on the screen by clearing the screen, printing the numbers, then clearing the screen again.

3. You may want to adjust line 2410 to get suitable delay times.

PROGRAM LISTING: BASIC

```
100 REM MEMORY TEST-NUMBERS BY GARY ORWIG
1000 REM INITIALIZATION
1010 DIM A$(5)
```

```
1020 DIM AB$(60)
1030 DIM NA$(30)
1040 DIM SA$(60)
1050 REM USE FULL SCREEN
1060 POKE 82,0
1070 PRINT
2000 REM INTRODUCTION
2010 FOR I=1 TO 40
2020 GOSUB 10000
2030 PRINT AB$
2040 NEXT I
2050 FOR I=1 TO 200
2060 NEXT I
2070 FOR I=1 TO 12
2080 PRINT
2090 NEXT I
2100 PRINT "        MEMORY TEST - NUMBERS"
2110 FOR I=1 TO 12
2120 PRINT
2130 NEXT I
2140 PRINT "HI!  I AM A FRIENDLY COMPUTER!"
2150 PRINT "WHAT IS YOUR NAME";
2160 INPUT NA$
2170 PRINT
2180 PRINT
2190 PRINT "IT'S NICE TO MEET YOU, ";NA$;"."
2200 PRINT
2210 PRINT
2220 PRINT "THIS IS A GAME DESIGNED TO TEST"
2230 PRINT "YOUR MEMORY FOR NUMBERS."
2240 PRINT
2250 PRINT "I WILL SHOW YOU A NUMBER, AND YOU WILL"
2260 PRINT "TRY TO REMEMBER IT LONG ENOUGH"
2270 PRINT "TO TYPE IT BACK TO ME."
2280 PRINT
2290 PRINT
2300 PRINT "I CAN SHOW YOU THE NUMBER FOR:"
2310 PRINT
2320 PRINT "1. A SHORT TIME"
2330 PRINT "2. A MEDIUM TIME"
2340 PRINT "3. A LONG TIME"
2350 PRINT
2360 PRINT
2370 PRINT "WHICH DO YOU WANT (1, 2, OR 3)"
2380 PRINT "YOU CAN USE A DECIMAL (LIKE.5)"
2390 PRINT "OR A LARGER NUMBER IF YOU WANT."
2400 INPUT DE
2410 DE=DE*50
2420 FOR I=1 TO 12
2430 PRINT
2440 NEXT I
2450 PRINT "OK!  HERE WE GO!"
2460 AB$=""
2470 FOR I=1 TO 12
2480 PRINT
2490 NEXT I
```

```
2500 FOR I=1 TO 200
2510 NEXT I
4000 REM MAIN PROGRAM
4010 GOSUB 10000
4020 FOR I=1 TO 25
4030 PRINT
4040 NEXT I
4050 PRINT AB$
4060 FOR I=1 TO DE
4070 NEXT I
4080 FOR I=1 TO 25
4090 PRINT
4100 NEXT I
4110 PRINT "WHAT WAS THE NUMBER?"
4120 INPUT SA$
4130 GOSUB 11000
4140 IF HT=0 THEN 4180
4150 GOSUB 12000
4160 GOSUB 15000
4170 GOTO 4010
4180 GOSUB 14000
4190 GOTO 20000
10000 REM RANDOMIZATION
10010 A$=STR$(INT(RND(0)*10))
10020 AB$(LEN(AB$)+1)=A$
10030 RETURN
11000 REM JUDGE ANSWER
11010 IF SA$=AB$ THEN GOTO 11040
11020 HT=0
11030 RETURN
11040 HT=1
11050 RETURN
12000 REM REWARDS
12010 HT=0
12020 PRINT "GREAT!"
12030 FOR I=1 TO 250
12040 NEXT I
12050 RETURN
14000 REM WRONG
14010 FOR I=1 TO 12
14020 PRINT
14030 NEXT I
14040 PRINT "SORRY!"
14050 FOR I=1 TO 10
14060 PRINT
14070 NEXT I
14080 RETURN
15000 REM SCORE KEEPING
15010 C=C+1
15020 RETURN
20000 REM CLOSING
20010 PRINT "YOUR ANSWER WAS:"
20020 PRINT SA$
20030 PRINT
20040 PRINT "THE CORRECT NUMBER WAS:"
20050 PRINT AB$
```

```
20060 PRINT
20070 PRINT
20080 PRINT "YOU REMEMBERED A NUMBER"
20090 PRINT C;" DIGITS LONG!"
20100 PRINT "DO YOU WANT TO TRY AGAIN?"
20110 PRINT "(YES OR NO)";
20120 INPUT SA$
20130 IF SA$="YES" THEN 20160
20140 PRINT "BYE FOR NOW!"
20150 END
20160 SA$=""
20170 AB$=""
20180 C=0
20190 GOTO 2280
```

TABLE OF VARIABLES

A$
```
   1010   10010  10020
```

AB$
```
   1020   2030   2460   4050   10020 10020
   11010  20050  20170
```

NA$
```
   1030   2160   2190
```

SA$
```
   1040   4120   11010  20020  20120  20130
   20160
```

I
```
   2010   2040   2050   2060   2070   2090
   2110   2130   2420   2440   2470   2490
   2500   2510   4020   4040   4060   4070
   4080   4100   12030  12040  14010  14030
   14050  14070
```

DE
```
   2400   2410   2410   4060
```

HT
```
   4140   11020  11040  12010
```

C
```
   15010  15010  20090  20180
```

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM  MEMORY TEST-NUMBERS BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM INITIALIZE
1010 REM USE FULL SCREEN
```

```
1020 POKE 82,0
1030 CLS
2000 REM   INTRODUCTION
2010 FOR I = 1 TO 40
2020 GOSUB 10000
2030 PRINT AB$
2040 NEXT I
2050 FOR I = 1 TO 2000
2060 NEXT I
2070 FOR I = 1 TO 12
2080 PRINT
2090 NEXT I
2100 PRINT "          MEMORY TEST - NUMBERS"
2110 FOR I = 1 TO 12
2120 PRINT
2130 NEXT I
2140 PRINT "HI!   I AM A FRIENDLY COMPUTER!"
2150 PRINT "WHAT IS YOUR NAME";
2160 INPUT NA$
2170 PRINT
2180 PRINT
2190 PRINT "IT'S NICE TO MEET YOU, ";NA$;"."
2200 PRINT
2210 PRINT
2220 PRINT "THIS IS A GAME DESIGNED TO TEST"
2230 PRINT "YOUR MEMORY FOR NUMBERS."
2240 PRINT
2250 PRINT "I WILL SHOW YOU A NUMBER, AND YOU WILL"
2260 PRINT "TRY TO REMEMBER IT LONG ENOUGH"
2270 PRINT "TO TYPE IT BACK TO ME."
2280 PRINT
2290 PRINT
2300 PRINT "I CAN SHOW YOU THE NUMBER FOR:"
2310 PRINT
2320 PRINT "1. A SHORT TIME"
2330 PRINT "2. A MEDIUM TIME"
2340 PRINT "3. A LONG TIME"
2350 PRINT
2360 PRINT
2370 PRINT "WHICH DO YOU WANT (1, 2, OR 3)"
2380 PRINT "YOU CAN USE A DECIMAL (LIKE.5)"
2390 PRINT "OR A LARGER NUMBER IF YOU WANT."
2400 INPUT DE
2410 DE = DE * 500
2420 FOR I = 1 TO 12
2430 PRINT
2440 NEXT I
2450 PRINT "OK!   HERE WE GO!"
2460 AB$ = " "
2470 FOR I = 1 TO 12
2480 PRINT
2490 NEXT I
2500 FOR I = 1 TO 2000
2510 NEXT I
4000 REM   MAIN PROGRAM
4010 GOSUB 10000
```

```
4020 FOR I = 1 TO 25
4030 PRINT
4040 NEXT I
4050 PRINT AB$
4060 FOR I = 1 TO DE
4070 NEXT I
4080 FOR I = 1 TO 25
4090 PRINT
4100 NEXT I
4110 PRINT "WHAT WAS THE NUMBER?"
4120 INPUT SA$
4130 GOSUB 11000
4140 IF HT = 0 THEN 4180
4150 GOSUB 12000
4160 GOSUB 15000
4170 GOTO 4010
4180 GOSUB 14000
4190 GOTO 20000
10000 REM    RANDOMIZATION
10010 A$ =  STR$ ( RND (9))
10020 A$ =  RIGHT$ (A$,1)
10030 AB$ = AB$ + A$
10040 RETURN
11000 REM   JUDGE ANSWER
11010 IF SA$ = AB$ GOTO 11040
11020 HT = 0
11030 RETURN
11040 HT = 1
11050 RETURN
12000 REM   REWARDS
12010 HT = 0
12020 PRINT "GREAT!"
12030 FOR I = 1 TO 1000
12040 NEXT I
12050 RETURN
14000 REM   WRONG
14010 FOR I = 1 TO 12
14020 PRINT
14030 NEXT I
14040 PRINT "SORRY!"
14050 FOR I = 1 TO 10
14060 PRINT
14070 NEXT I
14080 RETURN
15000 REM   SCORE KEEPING
15010 C = C + 1
15020 RETURN
20000 REM   CLOSING
20010 PRINT "YOUR ANSWER WAS:"
20020 PRINT SA$
20030 PRINT
20040 PRINT "THE CORRECT NUMBER WAS:"
20050 PRINT AB$
20060 PRINT
20070 PRINT
20080 PRINT "YOU REMEMBERED A NUMBER"
```

```
20090 PRINT C;" DIGITS LONG!"
20100 PRINT "DO YOU WANT TO TRY AGAIN?"
20110 PRINT "(YES OR NO)";
20120 INPUT SA$
20130 IF SA$ = "YES" THEN 20160
20140 PRINT "BYE FOR NOW!"
20150 END
20160 SA$ = ""
20170 AB$ = ""
20180 C = 0
20190 GOTO 2280
```

TABLE OF VARIABLES

```
A$ - SINGLE DIGIT
10010 10015 10015 10020

AB$ - SET OF DIGITS
2030 2460 4050 10020 10020
11010 20050 20170

C - CORRECT RESPONSES
15010 15010 20090 20180

DE - DELAY
2400 2410 2410 4060

HT - HIT
4140 11020 11040 12010

I - COUNTER
2010 2040 2050 2060 2070 2090
2110 2130 2420 2440 2470 2490
2500 2510 4020 4040 4060 4070
4080 4100 12030 12040 14010
14030 14050 14070

NA$ - NAME
2160 2190

SA$ - STUDENT ANSWER
4120 11010 20020 20120 20130
20160

END OF VAR. LIST
```

SAMPLE RUN

```
HI!  I AM A FRIENDLY COMPUTER!
WHAT IS YOUR NAME?ALLEN


IT'S NICE TO MEET YOU, ALLEN.
```

```
THIS IS A GAME DESIGNED TO TEST
YOUR MEMORY FOR NUMBERS.

I WILL SHOW YOU A NUMBER, AND YOU WILL
TRY TO REMEMBER IT LONG ENOUGH
TO TYPE IT BACK TO ME.


I CAN SHOW YOU THE NUMBER FOR:

1. A SHORT TIME
2. A MEDIUM TIME
3. A LONG TIME


WHICH DO YOU WANT (1, 2, OR 3)
YOU CAN USE A DECIMAL (LIKE.5)
OR A LARGER NUMBER IF YOU WANT.
?1


OK!  HERE WE GO!



                                           .


8


WHAT WAS THE NUMBER?
?8
GREAT!


88


WHAT WAS THE NUMBER?
?88
GREAT!


880


WHAT WAS THE NUMBER?
?880
GREAT!


8807


WHAT WAS THE NUMBER?
?8807
GREAT!
```

```
88079


WHAT WAS THE NUMBER?
?88079
GREAT!


880797


WHAT WAS THE NUMBER?
?880797
GREAT!


8807971


WHAT WAS THE NUMBER?
?8807971
GREAT!


88079711


WHAT WAS THE NUMBER?
?8807971


SORRY!


YOUR ANSWER WAS:
8807971

THE CORRECT NUMBER WAS:
88079711


YOU REMEMBERED A NUMBER
7 DIGITS LONG!
DO YOU WANT TO TRY AGAIN?
(YES OR NO)?NO
BYE FOR NOW!
```

Scrambled Words

PROGRAM DESCRIPTION

In this program the computer selects words from an instructor-made data file and scrambles the letters in the words. The computer displays a scrambled word on the screen and asks you to identify it. By entering in a "?", the computer provides you with hints about the word. This program is an excellent drill for both spelling and reading.

PROGRAM NOTES

1. Consider setting a letter in place each time a cue (like "*") is typed in. It would probably be best to start from the end of the word and work toward the beginning. This could be accomplished by randomizing a shorter length of the word each time the "*" is typed in.

2. Be careful of using words whose letters make up other words (snake, sneak). While some of these are likely to get into your list, too many can be frustrating.

PROGRAM LISTING: BASIC

```
100 REM SCRAMBLED WORDS BY GARY ORWIG
1000 REM INITIALIZATION - SET 'TL' EQUAL TO TOTAL NUMBER OF
WORDS IN YOUR DATA SET.
1010 TL=20
1020 BL=TL
1030 TL=TL+1
```

```
1040 DIM FL$(TL*20),HN$(TL*20),B$(20),C$(20),D$(1),NA$(30),S
$(20),T$(20),FLI$(20),HNI$(20)
1050 FOR I=1 TO TL
1060 FL$(I*20-19,I*20)="
1070 NEXT I
1080 HN$=FL$
1090 LN=1
1100 FOR I=1 TO TL
1110 READ FLI$,HNI$
1120 FL$(LN)=FLI$
1130 HN$(LN)=HNI$
1140 LN=LN+20
1150 NEXT I
1160 REM USE FULL SCREEN
1170 POKE 82,0
1180 PRINT
1190 TL=TL-1
2000 REM INTRODUCTION
2010 FOR I=1 TO 75
2020 PRINT "WORD SCRAMBLE ";
2030 NEXT I
2040 FOR I=1 TO 200
2050 NEXT I
2060 FOR I=1 TO 24
2070 PRINT
2080 NEXT I
2090 PRINT "HI!  I'M YOUR FRIENDLY COMPUTER!"
2100 PRINT
2110 PRINT
2120 PRINT "WHAT IS YOUR NAME?"
2130 INPUT NA$
2140 PRINT
2150 PRINT "I'M GLAD TO MEET YOU, ";NA$;"."
2160 PRINT
2170 PRINT
2180 PRINT "WE ARE GOING TO PLAY A WORD GAME."
2190 PRINT "I WILL THINK OF A WORD AND"
2200 PRINT "SCRAMBLE UP THE LETTERS."
2210 PRINT
2220 PRINT "I WILL SHOW YOU THE LETTERS,"
2230 PRINT "AND YOU HAVE TO GUESS THE WORD!"
2240 PRINT "IF YOU TYPE IN A '?' I WILL"
2250 PRINT "GIVE YOU A HINT."
2260 PRINT
2270 PRINT "HERE WE GO!"
4000 REM MAIN PROGRAM
4010 GOSUB 10000
4020 C$=FL$(R*20-19,R*20)
4030 L=0
4040 L=L+1
4050 IF C$(L,L)=" " THEN 4070
4060 GOTO 4040
4070 L=L-1
4080 C$=C$(1,L)
4090 T$=""
4100 FOR I=1 TO L
4110 B$(I,I)="#"
```

```
4120 NEXT I
4130 FOR I=1 TO L
4140 D$=C$(I,I)
4150 J=INT(RND(0)*L)+1:REM MIX POSITION
4160 IF B$(J,J)="#" THEN 4180
4170 GOTO 4150
4180 B$(J,J)=D$
4190 NEXT I
4200 T$=B$
4210 IF T$=C$ THEN 4090
4220 PRINT
4230 PRINT "HERE IS THE SCRAMBLED WORD."
4240 PRINT
4250 PRINT T$
4260 PRINT
4270 PRINT "WHAT DO YOU THINK THE WORD IS?"
4280 PRINT "TYPE IN A '?' FOR A HINT."
4290 INPUT S$
4300 GOSUB 11000
4310 IF HT=1 THEN 15000
4320 GOTO 4230
10000 REM RANDOMIZATION
10010 R=INT(RND(0)*BL)+1
10020 RETURN
11000 REM JUDGE ANSWER
11010 IF S$="?" THEN 16000
11020 TR=TR+1
11030 IF S$=C$ THEN 12000
11040 GOTO 14000
12000 REM REWARD
12010 HT=1
12020 PRINT "GOOD GUESS, ";NA$;"!"
12030 RETURN
14000 REM WRONG GUESS
14010 PRINT "SORRY, ";NA$;".   ";S$
14020 PRINT "IS NOT THE WORD.  TRY AGAIN!"
14030 RETURN
15000 REM SCORE KEEPING
15010 HT=0
15020 PRINT "YOU FOUND THE WORD IN"
15030 IF TR=1 THEN 15060
15040 PRINT TR;" TRIES!"
15050 GOTO 20000
15060 PRINT "ONE TRY!"
15070 GOTO 20000
16000 REM HINT
16010 PRINT
16020 PRINT HN$(R*20-19,R*20)
16030 HN$(R*20-19,R*20)="NO MORE HINTS!"
16040 PRINT
16050 RETURN
20000 REM CLOSING
20010 PRINT "WOULD YOU LIKE ANOTHER WORD (YES OR NO)";
20020 INPUT S$
20030 IF S$="YES" THEN 20060
20040 PRINT "BYE FOR NOW!"
```

```
20050 END
20060 S$=""
20070 B$="                              "
20080 T$=B$
20090 B$=""
20100 T$=B$
20110 TR=0
20120 HT=0
20130 REM DELETE CORRECT WORD FROM LIST
20140 FL$(R*20-19,R*20)=FL$(BL*20-19,BL*20)
20150 HN$(R*20-19,R*20)=HN$(BL*20-19,BL*20)
20160 BL=BL-1
20170 IF BL=0 THEN 20190
20180 GOTO 4010
20190 PRINT "SORRY, YOU HAVE USED ALL MY WORDS!"
20200 GOTO 20040
21000 REM DATA
21010 DATA CHAIR,SIT,BREAKFAST,MORNING,PICTURE,WALL,MONEY,PA
Y,GRASS,GREEN
21020 DATA DRIVEWAY,CEMENT,LIBRARY,BOOKS,RASPBERRY,FRUIT,PIL
LOW,SLEEP,CLOTHES,WEAR
21030 DATA BICYCLE,RIDE,DESSERT,CAKE,TELEPHONE,TALK,PIANO,MU
SIC,PENCIL,WRITE
21040 DATA SLEIGH,SNOW,OCEAN,WATER,AIRPLANE,FLY,EXERCISE,JOG
,GIRAFFE,ANIMAL
21050 DATA EOD,EOD
```

TABLE OF VARIABLES

TL

1010	1020	1030	1030	1040	1040
1050	1100	1190	1190		

BL

1020	10010	20140	20140	20150	20150
20160	20160	20170			

FL$

1040	1060	1080	1120	4020	20140
20140					

HN$

1040	1080	1130	16020	16030	20150
20150					

B$

1040	4110	4160	4180	4200	20070
20080	20090	20100			

C$

1040	4020	4050	4080	4080	4140
4210	11030				

D$

1040	4140	4180

NA$
```
  1040   2130   2150   12020  14010
```

S$
```
  1040   4290   11010  11030  14010  20020
  20030  20060
```

T$
```
  1040   4090   4200   4210   4250   20080
  20100
```

FLI$
```
  1040   1110   1120
```

HNI$
```
  1040   1110   1130
```

I
```
  1050   1060   1060   1070   1100   1150
  2010   2030   2040   2050   2060   2080
  4100   4110   4110   4120   4130   4140
  4140   4190
```

LN
```
  1090   1120   1130   1140   1140
```

R
```
  4020   4020   10010  16020  16020  16030
  16030  20140  20140  20150  20150
```

L
```
  4030   4040   4040   4050   4050   4070
  4070   4080   4100   4130   4150
```

J
```
  4150   4160   4160   4180   4180
```

HT
```
  4310   12010  15010  20120
```

TR
```
  11020  11020  15030  15040  20110
```


PROGRAM LISTING: MICROSOFT BASIC

```
100 REM    SCRAMBLED WORDS BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM   INITIALIZATION - SET 'TL' EQUAL TO TOTAL NUMBER OF
 WORDS IN YOUR DATA SET.
1010 TL = 20
1020 BL = TL
1030 DIM FL$(TL),HN$(TL),B$(20)
1040 FOR I = 1 TO TL
1050 READ FL$(I),HN$(I)
```

```
1060 NEXT I
1070 REM USE FULL SCREEN
1080 POKE 82,0
1090 CLS
2000 REM   INTRODUCTION
2010 FOR I = 1 TO 20
2020 PRINT "WORD SCRAMBLE ";
2030 NEXT I
2040 FOR I = 1 TO 3000
2050 NEXT I
2060 FOR I = 1 TO 24
2070 PRINT
2080 NEXT I
2090 PRINT "HI!  I'M YOUR FRIENDLY COMPUTER!"
2100 PRINT
2110 PRINT
2120 PRINT "WHAT IS YOUR NAME?"
2130 INPUT NA$
2140 PRINT
2150 PRINT "I'M GLAD TO MEET YOU, ";NA$;"."
2160 PRINT
2170 PRINT
2180 PRINT "WE ARE GOING TO PLAY A WORD GAME."
2190 PRINT "I WILL THINK OF A WORD AND"
2200 PRINT "SCRAMBLE UP THE LETTERS."
2210 PRINT
2220 PRINT "I WILL SHOW YOU THE LETTERS,"
2230 PRINT "AND YOU HAVE TO GUESS THE WORD!"
2240 PRINT "IF YOU TYPE IN A '?' I WILL"
2250 PRINT "GIVE YOU A HINT."
2260 PRINT
2270 PRINT "HERE WE GO!"
4000 REM   MAIN PROGRAM
4010 GOSUB 10000
4020 C$ = FL$(R)
4030 L =  LEN (C$)
4040 T$ = ""
4050 FOR I = 1 TO L
4060 B$(I) = "#"
4070 NEXT I
4080 FOR I = 1 TO L
4090 D$ =  MID$ (C$,I,1)
4100 J =  RND(L):REM MIX POSITION
4110 IF B$(J) = "#" THEN 4130
4120 GOTO 4100
4130 B$(J) = D$
4140 NEXT I
4150 FOR I = 1 TO L
4160 T$ = T$ + B$(I)
4170 NEXT I
4180 IF T$ = C$ THEN 4040
4190 PRINT
4200 PRINT "HERE IS THE SCRAMBLED WORD."
4210 PRINT
4220 PRINT T$
4230 PRINT
```

```
4240 PRINT "WHAT DO YOU THINK THE WORD IS?"
4250 PRINT "TYPE IN A '?' FOR A HINT."
4260 INPUT S$
4270 GOSUB 11000
4280 IF HT = 1 THEN 15000
4290 GOTO 4200
10000 REM     RANDOMIZATION
10010 R =   RND(BL)
10020 RETURN
11000 REM   JUDGE ANSWER
11010 IF S$ = "?" THEN 16000
11020 TR = TR + 1
11030 IF S$ = C$ THEN 12000
11040 GOTO 14000
12000 REM   REWARD
12010 HT = 1
12020 PRINT "GOOD GUESS, ";NA$;"!"
12030 RETURN
14000 REM   WRONG GUESS
14010 PRINT "SORRY, ";NA$;".   ";S$
14020 PRINT "IS NOT THE WORD.  TRY AGAIN!"
14030 RETURN
15000 REM   SCORE KEEPING
15010 HT = 0
15020 PRINT "YOU FOUND THE WORD IN"
15030 IF TR = 1 THEN 15060
15040 PRINT TR;" TRIES!"
15050 GOTO 20000
15060 PRINT "ONE TRY!"
15070 GOTO 20000
16000 REM   HINT
16010 PRINT
16020 PRINT HN$(R)
16030 HN$(R) = "NO MORE HINTS!"
16040 PRINT
16050 RETURN
20000 REM   CLOSING
20010 PRINT "WOULD YOU LIKE ANOTHER WORD (YES OR NO)";
20020 INPUT S$
20030 IF S$ = "YES" THEN 20060
20040 PRINT "BYE FOR NOW!"
20050 END
20060 S$ = ""
20070 TR = 0
20080 HT = 0
20090 REM   DELETE CORRECT WORD FROM LIST
20100 FL$(R) = FL$(BL)
20110 HN$(R) = HN$(BL)
20120 BL = BL - 1
20130 IF BL = 0 THEN 20150
20140 GOTO 4010
20150 PRINT "SORRY, YOU HAVE USED ALL MY WORDS!"
20160 GOTO 20040
21000 REM   DATA
21010 DATA   CHAIR,SIT,BREAKFAST,MORNING,PICTURE,WALL,MONEY,P
AY,GRASS,GREEN
```

```
21020 DATA   DRIVEWAY,CEMENT,LIBRARY,BOOKS,RASPBERRY,FRUIT,PI
LLOW,SLEEP,CLOTHES,WEAR
21030 DATA   BICYCLE,RIDE,DESSERT,CAKE,TELEPHONE,TALK,PIANO,M
USIC,PENCIL,WRITE
21040 DATA   SLEIGH,SNOW,OCEAN,WATER,AIRPLANE,FLY,EXERCISE,JO
G,GIRAFFE,ANIMAL
```

TABLE OF VARIABLES

B$(*) - SCRAMBLED WORD ARRAY
1030 4060 4110 4130 4160

BL - BOTTOM OF LIST MARKER
1020 10010 20100 20110 20120
20120 20130

C$ - CORRECT WORD
4020 4030 4090 4180 11030

D$ - SINGLE LETTER OF WORD
4090 4130

FL$(*) - WORD LIST
1030 1050 4020 20100 20100

HN$(*) - HINT LIST
1030 1050 16020 16030 20110
20110

HT - HIT
4280 12010 15010 20080

I - COUNTER
1040 1050 1050 1060 2010 2030
2040 2050 2060 2080 4050 4060
4070 4080 4090 4140 4150 4160
4170

J - RANDOM NUMBER FOR POSITION
4100 4110 4130

L - LENGTH OF WORD
4030 4050 4080 4100 4150

NA$ - NAME
2130 2150 12020 14010

R - RANDOM NUMBER
4020 10010 16020 16030 20100
20110

S$ - STUDENT ANSWER
4260 11010 11030 14010 20020
20030 20060

T$ - SCRAMBLED WORD
4040 4160 4160 4180 4220

TL - NUMBER OF WORDS IN LIST
1010 1020 1030 1030 1040

TR - NUMBER OF TRIES
11020 11020 15030 15040 20070

END OF VAR. LIST

SAMPLE RUN

HI! I'M YOUR FRIENDLY COMPUTER!

WHAT IS YOUR NAME?
?MARLA

I'M GLAD TO MEET YOU, MARLA.

WE ARE GOING TO PLAY A WORD GAME.
I WILL THINK OF A WORD AND
SCRAMBLE UP THE LETTERS.

I WILL SHOW YOU THE LETTERS,
AND YOU HAVE TO GUESS THE WORD!
IF YOU TYPE IN A '?' I WILL
GIVE YOU A HINT.

HERE WE GO!

HERE IS THE SCRAMBLED WORD.

LEHNTOEEP

WHAT DO YOU THINK THE WORD IS?
TYPE IN A '?' FOR A HINT.
?ELEPHANT
SORRY, MARLA. ELEPHANT
IS NOT THE WORD. TRY AGAIN!
HERE IS THE SCRAMBLED WORD.

LEHNTOEEP

WHAT DO YOU THINK THE WORD IS?
TYPE IN A '?' FOR A HINT.
??

TALK

HERE IS THE SCRAMBLED WORD.

LEHNTOEEP

```
WHAT DO YOU THINK THE WORD IS?
TYPE IN A '?' FOR A HINT.
?TELEPHONE
GOOD GUESS, MARLA!
YOU FOUND THE WORD IN
2 TRIES!
WOULD YOU LIKE ANOTHER WORD (YES OR NO)?NO
BYE FOR NOW!
```

Spelling Quiz

PROGRAM DESCRIPTION

This program selects spelling words from an instructor-made data file. The computer rapidly scrolls a word at different time intervals and then asks you to spell the selected word. You may choose at which time interval (short, medium, or long) you want the computer to display the word to be spelled. At the end of the data word file, the computer will repeat any words that were missed until all of the words in the file are spelled correctly.

PROGRAM NOTES

1. Consider "flashing" the words, rather than scrolling them. This can be done by clearing the screen, printing the word, then clearing the screen again.

2. Consider presenting the words over the ATARI tape recorder. This will require a bit of research, and you won't be able to randomize, but it would be interesting!

PROGRAM LISTING: BASIC

```
100 REM SPELLING QUIZ BY GARY ORWIG
1000 REM INITIALIZATION - SET 'TL' TO TOTAL NUMBER OF WORDS
IN YOUR DATA SET.
1010 TL=20
1020 DIM A$(30)
1030 DIM NA$(30)
1040 DIM S$(30)
```

```
1050 REM USE FULL SCREEN
1060 POKE 82,0
1070 DIM W(TL)
1080 REM CLEAR CORRECT ANSWER ARRAY
1090 FOR I=1 TO TL
1100 W(I)=0
1110 NEXT I
2000 REM INTRODUCTION
2010 L=12
2020 GOSUB 18000
2030 PRINT "              SPELLING QUIZ"
2040 GOSUB 18000
2050 D=200
2060 GOSUB 19000
2070 PRINT "HELLO!  I'M GLAD YOU COULD MAKE IT!"
2080 PRINT "WHAT'S YOUR NAME?"
2090 INPUT NA$
2100 PRINT
2110 PRINT "IT'S NICE TO MEET YOU, ";NA$;"."
2120 L=4
2130 GOSUB 18000
2140 PRINT "THIS IS A GAME WHERE I WILL"
2150 PRINT "GIVE YOU WORDS TO PRACTICE SPELLING."
2160 PRINT "SINCE I CAN'T TALK, I WILL FLASH"
2170 PRINT "A WORD ON THE SCREEN FOR JUST A"
2180 PRINT "MOMENT, THEN I WILL WAIT FOR YOU"
2190 PRINT "TO TYPE IT BACK IN."
2200 PRINT
2210 PRINT "I CAN LET YOU SEE THE WORDS FOR:"
2220 PRINT "     1. A SHORT TIME"
2230 PRINT "     2. A MEDIUM TIME"
2240 PRINT "     3. A LONG TIME"
2250 PRINT
2260 PRINT "WHICH WOULD YOU PREFER (TYPE 1,2,OR 3)"
2270 INPUT T
2280 T=T*50
2290 PRINT "VERY GOOD, HERE WE GO!"
2300 GOSUB 19000
4000 REM MAIN PROGRAM
4010 GOSUB 10000
4020 L=12
4030 GOSUB 18000
4040 PRINT "              ";A$
4050 GOSUB 18000
4060 D=T
4070 GOSUB 19000
4080 GOSUB 18000
4090 PRINT "WHAT WAS THE WORD"
4100 INPUT S$
4110 GOSUB 15000
4120 GOSUB 11000
4130 IF HT=1 THEN 4190
4140 GOSUB 14000
4150 PRINT "WE WILL TRY THAT ONE AGAIN LATER!"
4160 D=500
4170 GOSUB 19000
4180 GOTO 4010
```

```
4190 GOSUB 12000
4200 D=500
4210 GOSUB 19000
4220 GOTO 4010
10000 REM SEQUENCING
10010 W=W+1
10020 IF W=TL+1 THEN W=1
10030 IF W(W)=1 THEN GOTO 10010
10040 RESTORE
10050 FOR I=1 TO W
10060 READ A$
10070 NEXT I
10080 RETURN
11000 REM JUDGE ANSWER
11010 IF S$=A$ THEN GOTO 11040
11020 HT=0
11030 RETURN
11040 HT=1
11050 RETURN
12000 REM REWARDS
12010 FOR I=1 TO 100
12020 PRINT "GREAT!     ";
12030 NEXT I
12040 C=C+1
12050 IF C=TL THEN 20000
12060 W(W)=1
12070 RETURN
14000 REM WRONG
14010 FOR I=1 TO 100
14020 PRINT "SORRY!    ";
14030 NEXT I
14040 L=3
14050 GOSUB 18000
14060 RETURN
15000 REM SCORE KEEPING
15010 N=N+1
15020 RETURN
18000 REM SCROLLING
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM TIME DELAY
19010 FOR I=1 TO D
19020 NEXT I
19030 RETURN
20000 REM CLOSING
20010 PRINT "WE ARE FINISHED, ";NA$;"!"
20020 PRINT "IT TOOK YOU ";N;" TRIES"
20030 PRINT "TO SPELL THE ";TL;" WORDS."
21000 REM DATA
21010 DATA FEBRUARY,GHOST,ALUMINUM,PRECEDE,RECEIVE,JUDGEMENT
,KNOWLEDGE,FRAGILE,NINETY,GUARANTEE
21020 DATA JEWELRY,NUCLEAR,OMITTED,OCCURRENCE,MANAGEABLE,TEC
HNICAL,GRIEVANCE,EXCUSABLE,DEVELOPMENT,COMPETENT
```

TABLE OF VARIABLES

TL
    1010   1070   1090   10020   12050   20030

A$
    1020   4040   10060   11010

NA$
    1030   2090   2110   20010

S$
    1040   4100   11010

W(
    1070   1100   10030   12060

I
    1090   1100   1110   10050   10070   12010
    12030   14010   14030   18010   18030   19010
    19020

L
    2010   2120   4020   14040   18010

D
    2050   4060   4160   4200   19010

T
    2270   2280   2280   4060

HT
    4130   11020   11040

W
    10010   10010   10020   10020   10030   10050
    12060

C
    12040   12040   12050

N
    15010   15010   20020

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM SPELLING QUIZ BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM INITIALIZATION - SET 'TL' TO TOTAL NUMBER OF WORDS
IN YOUR DATA SET.
1010 TL=20
1020 BL=TL
```

```
1030 DIM A$(TL)
1040 FOR I=1 TO TL
1050 READ A$(I)
1060 NEXT I
1070 REM USE FULL SCREEN
1080 POKE 82,0
1090 CLS
2000 REM INTRODUCTION
2010 L=12
2020 GOSUB 18000
2030 PRINT "          SPELLING QUIZ"
2040 GOSUB 18000
2050 D=2000
2060 GOSUB 19000
2070 PRINT "HELLO!  I'M GLAD YOU COULD MAKE IT!"
2080 PRINT "WHAT'S YOUR NAME?"
2090 INPUT NA$
2100 PRINT
2110 PRINT "IT'S NICE TO MEET YOU, ";NA$;"."
2120 L=4
2130 GOSUB 18000
2140 PRINT "THIS IS A GAME WHERE I WILL"
2150 PRINT "GIVE YOU WORDS TO PRACTICE SPELLING."
2160 PRINT "SINCE I CAN'T TALK, I WILL FLASH"
2170 PRINT "A WORD ON THE SCREEN FOR JUST A"
2180 PRINT "MOMENT, THEN I WILL WAIT FOR YOU"
2190 PRINT "TO TYPE IT BACK IN."
2200 PRINT
2210 PRINT "I CAN LET YOU SEE THE WORDS FOR:"
2220 PRINT "     1. A SHORT TIME"
2230 PRINT "     2. A MEDIUM TIME"
2240 PRINT "     3. A LONG TIME"
2250 PRINT
2260 PRINT "WHICH WOULD YOU PREFER (TYPE 1,2,OR 3)"
2270 INPUT T
2280 T=T*200
2290 PRINT "VERY GOOD, HERE WE GO!"
2300 GOSUB 19000
4000 REM MAIN PROGRAM
4010 GOSUB 10000
4020 L=12
4030 GOSUB 18000
4040 PRINT "          ";A$(R)
4050 GOSUB 18000
4060 D=T
4070 GOSUB 19000
4080 GOSUB 18000
4090 PRINT "WHAT WAS THE WORD"
4100 INPUT S$
4110 GOSUB 15000
4120 GOSUB 11000
4130 IF HT=1 THEN 4190
4140 GOSUB 14000
4150 PRINT "WE WILL TRY THAT ONE AGAIN LATER!"
```

```
4160 D=2000
4170 GOSUB 19000
4180 GOTO 4010
4190 GOSUB 12000
4200 D=2000
4210 GOSUB 19000
4220 REM DELETE CORRECT ANSWER FROM LIST OF WORDS
4230 A$(R)=A$(BL)
4240 BL=BL-1
4250 IF BL=0 THEN 20000
4260 GOTO 4010
10000 REM RANDOMIZATION
10010 R=RND(BL)
10020 RETURN
11000 REM JUDGE ANSWER
11010 IF S$=A$(R) THEN 11040
11020 HT=0
11030 RETURN
11040 HT=1
11050 RETURN
12000 REM REWARDS
12010 FOR I=1 TO 100
12020 PRINT "GREAT!     ";
12030 NEXT I
12040 RETURN
14000 REM WRONG
14010 FOR I=1 TO 100
14020 PRINT "SORRY!    ";
14030 NEXT I
14040 L=3
14050 GOSUB 18000
14060 RETURN
15000 REM SCORE KEEPING
15010 N=N+1
15020 RETURN
18000 REM SCROLLING
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM TIME DELAY
19010 FOR I=1 TO D
19020 NEXT I
19030 RETURN
20000 REM CLOSING
20010 PRINT "WE ARE FINISHED, ";NA$;"!"
20020 PRINT "IT TOOK YOU ";N;" TRIES"
20030 PRINT "TO SPELL THE ";TL;" WORDS."
21000 REM DATA
21010 DATA FEBRUARY,GHOST,ALUMINUM,PRECEDE,RECEIVE,JUDGEMENT
,KNOWLEDGE,FRAGILE,NINETY,GUARANTEE
21020 DATA JEWELRY,NUCLEAR,OMITTED,OCCURRENCE,MANAGEABLE,TEC
HNICAL,GRIEVANCE,EXCUSABLE,DEVELOPMENT,COMPETENT
```

TABLE OF VARIABLES

A$(*) — SPELLING WORD ARRAY
1030 1050 4040 4230 4230 11010

BL — BOTTOM OF LIST MARKER
1020 4230 4240 4240 4250 10010

D — DELAY TIMER
2050 4060 4160 4200 19010

HT — HIT (RIGHT ANSWER)
4130 11020 11040

I — GENERAL PURPOSE COUNTER
1040 1050 1060 12010 12030
14010 14030 18010 18030 19010
19020

L — NUMBER OF SCROLLING LINES
2010 2120 4020 14040 18010

N — SCORE KEEPER
15010 15010 20020

NA$ — STUDENT'S NAME
2090 2110 20010

R — RANDOM NUMBER
4040 4230 10010 11010

S$ — STUDENT'S ANSWER
4100 11010

T — DISPLAY TIME
2270 2280 2280 4060

TL — NUMBER OF WORDS IN LIST
1010 1020 1030 1040 20030

END OF VAR. LIST

SAMPLE RUN

HELLO! I'M GLAD YOU COULD MAKE IT!
WHAT'S YOUR NAME?
?AMY

IT'S NICE TO MEET YOU, AMY.

THIS IS A GAME WHERE I WILL
GIVE YOU WORDS TO PRACTICE SPELLING.
SINCE I CAN'T TALK, I WILL FLASH
A WORD ON THE SCREEN FOR JUST A

```
MOMENT, THEN I WILL WAIT FOR YOU
TO TYPE IT BACK IN.

I CAN LET YOU SEE THE WORDS FOR:
        1. A SHORT TIME
        2. A MEDIUM TIME
        3. A LONG TIME

WHICH WOULD YOU PREFER (TYPE 1,2,OR 3)
?1
VERY GOOD, HERE WE GO!


                NUCLEAR



WHAT WAS THE WORD
?NUCLEAR
GREAT!      GREAT!      GREAT!      GREAT!      GREAT!      GREAT!
GREAT!      GREAT!      GREAT!      GREAT!      GREAT!      GREAT!
GREAT!      GREAT!      GREAT!      GREAT!      GREAT!      GREAT!
GREAT!      GREAT!

                JUDGEMENT



WHAT WAS THE WORD
?JUDGEMENT
GREAT!      GREAT!      GREAT!      GREAT!      GREAT!      GREAT!
GREAT!      GREAT!      GREAT!      GREAT!      GREAT!      GREAT!
GREAT!      GREAT!      GREAT!      GREAT!      GREAT!      GREAT!
GREAT!      GREAT!

                TECHNICAL



WHAT WAS THE WORD
?TECHNICLE
SORRY!   SORRY!   SORRY!   SORRY!   SORRY!   SORRY!   SORRY!
   SORRY!   SORRY!   SORRY!   SORRY!   SORRY!   SORRY!   SOR
RY!   SORRY!   SORRY!   SORRY!   SORRY!   SORRY!   SORRY!

WE WILL TRY THAT ONE AGAIN LATER!
```

Story Teller
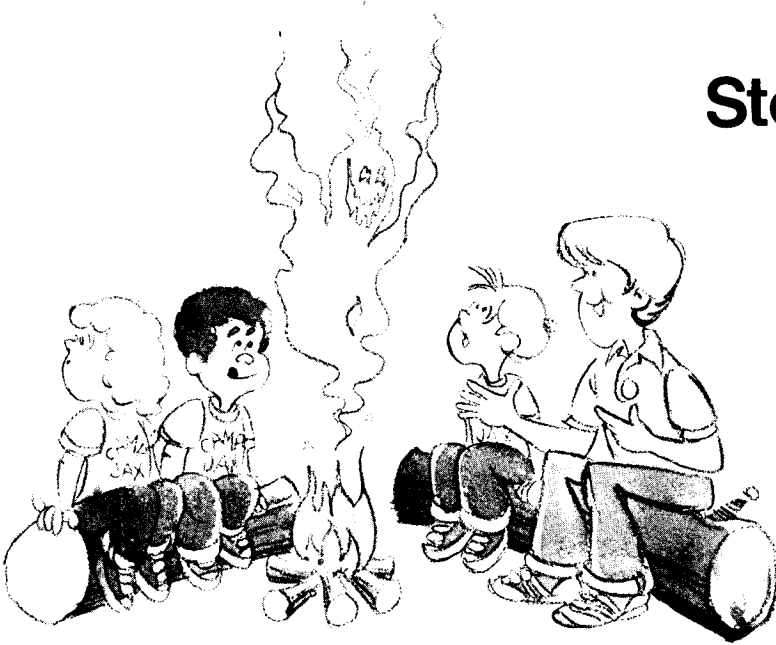
PROGRAM NOTES

1. Notice the DATA statements. Quotes are not used in the standard ATARI BASIC, and commas cannot be used. In the Microsoft BASIC, quotes are used, and commas can be allowed in the DATA statements.

2. Consider breaking your story at points and inserting questions to test for comprehension.

3. The "999" at the end of the DATA is commonly called an EOF (end of file) signal. It tells the computer that there is no more data.

4. Consider adding an over-all comprehension test at the end of your story.

PROGRAM DESCRIPTION

This program is an excellent drill for developing speed reading skills. The computer prints out an instructor-made data file story and you are requested to read the story as it is printed. You may adjust the speed of the printed material depending on which reading level you feel is most comfortable.

PROGRAM LISTING: BASIC

```
100 REM STORY TELLER BY GARY ORWIG
500 DATA "WILL YOU WALK INTO MY PARLOR?" SAID
```

```
502 DATA THE SPIDER TO THE FLY -
504 DATA "TIS THE PRETTIEST LITTLE PARLOR THAT
506 DATA EVER YOU DID SPY.
508 DATA THE WAY INTO MY PARLOR IS UP A WINDING
510 DATA STAIR;
512 DATA AND I HAVE MANY CURIOUS THINGS TO SHOW
514 DATA YOU WHEN YOU'RE THERE."
516 DATA %
518 DATA "OH&NO&NO&"SAID THE LITTLE FLY;
520 DATA "TO ASK ME IS IN VAIN;
522 DATA FOR WHO GOES UP YOUR WINDING STAIR
524 DATA CAN NE'ER COME DOWN AGAIN."
526 DATA %
528 DATA "I'M SURE YOU MUST BE WEARY& DEAR&
530 DATA WITH SOARING UP SO HIGH;
532 DATA WILL YOU NOT REST UPON MY LITTLE BED?"
534 DATA SAID THE SPIDER TO THE FLY.
536 DATA "THERE ARE PRETTY CURTAINS DRAWN AROUND;
538 DATA THE SHEETS ARE FINE AND THIN;
540 DATA AND IF YOU LIKE TO REST AWHILE&
542 DATA I'LL SNUGLY TUCK YOU IN!"
544 DATA %
546 DATA "OH& NO& NO&" SAID THE LITTLE FLY;
548 DATA "FOR I'VE OFTEN HEARD IT SAID&
550 DATA THEY NEVER& NEVER WAKE AGAIN&
552 DATA WHO SLEEP UPON YOUR BED!"
554 DATA %
556 DATA SAID THE CUNNING SPIDER TO THE FLY -
558 DATA "DEAR FRIEND& WHAT CAN I DO
560 DATA TO PROVE THE WARM AFFECTION I'VE ALWAYS
562 DATA FELT FOR YOU?"
564 DATA %
566 DATA "I THANK YOU& GENTLE SIR&" SHE SAID&
568 DATA "FOR WHAT YOU'RE PLEASED TO SAY&
570 DATA AND BIDDING YOU GOOD MORNING NOW&
572 DATA I'LL CALL ANOTHER DAY."
574 DATA %
576 DATA THE SPIDER TURNED HIM ROUND ABOUT
578 DATA AND WENT INTO HIS DEN&
580 DATA FOR WELL HE KNEW THE SILLY FLY
582 DATA WOULD SOON COME BACK AGAIN;
584 DATA SO HE WOVE A SUBTLE WEB
586 DATA IN A LITTLE CORNER SLY&
588 DATA AND SET HIS TABLE READY& TO DINE
590 DATA UPON THE FLY.
592 DATA %
594 DATA THEN HE CAME OUT TO HIS DOOR AGAIN&
596 DATA AND MERRILY DID SING -
598 DATA "COME HITHER& HITHER& PRETTY FLY&
600 DATA WITH THE PEARL AND SILVER WING;
602 DATA YOUR ROBES ARE GREEN AND PURPLE -
604 DATA THERE'S A CREST UPON YOUR HEAD!
606 DATA YOUR EYES ARE LIKE THE DIAMOND BRIGHT
608 DATA BUT MINE ARE DULL AS LEAD!"
610 DATA %
612 DATA ALAS! ALAS! HOW VERY SOON
```

```
614 DATA THIS SILLY LITTLE FLY&
616 DATA HEARING HIS WILY& FLATTERING WORDS
618 DATA CAME SLOWLY FLITTING BY.
620 DATA WITH BUZZING WINGS SHE HUNG ALOFT&
622 DATA THEN NEAR AND NEARER DREW;
624 DATA THINKING ONLY OF HER BRILLIANT EYES&
626 DATA HER GREEN AND PURPLE HUE -
628 DATA THINKING ONLY OF HER CRESTED HEAD -
630 DATA POOR FOOLISH THING!  AT LAST&
632 DATA UP JUMPED THE CUNNING SPIDER&
634 DATA AND FIRMLY HELD HER FAST!
636 DATA %
638 DATA HE DRAGGED HER UP HIS WINDING STAIR&
640 DATA INTO HIS DISMAL DEN&
642 DATA WITHIN HIS LITTLE PARLOR -
644 DATA BUT SHE NE'ER CAME OUT AGAIN!
646 DATA %
648 DATA %
650 DATA AND NOW& DEAR LITTLE CHILDREN&
652 DATA WHO MAY THIS STORY READ&
654 DATA TO IDLE& SILLY& FLATTERING WORDS&
656 DATA I PRAY YOU NE'ER GIVE HEED;
658 DATA UNTO AN EVIL COUNSELOR CLOSE HEART&
660 DATA AND EAR& AND EYE&
662 DATA AND TAKE A LESSON FROM THIS TALE
664 DATA OF THE SPIDER AND THE FLY!
666 DATA 999
1000 REM INITIALIZATION
1010 DIM A$(60)
1020 REM USE FULL SCREEN
1030 POKE 82,0
2000 REM INTRODUCTION
2010 L=24
2020 GOSUB 18000
2030 PRINT "              STORY TELLER"
2040 L=12
2050 GOSUB 18000
2060 D=250
2070 GOSUB 19000
2080 GOSUB 18000
2090 PRINT "THIS IS A PROGRAM WHICH TELLS"
2100 PRINT "YOU A STORY.  DO YOU WANT TO READ"
2110 PRINT
2120 PRINT "       1. FAST"
2130 PRINT "       2. MEDIUM"
2140 PRINT "       3. SLOW"
2150 PRINT
2160 PRINT "TYPE IN A NUMBER AND PRESS"
2170 PRINT "THE 'RETURN' KEY"
2180 L=8
2190 GOSUB 18000
2200 INPUT SA
2210 SP=SA*5
2220 PRINT
2230 PRINT "OK! HERE WE GO!"
2240 D=250
```

```
2250 GOSUB 19000
2260 L=24
2270 GOSUB 18000
4000 REM MAIN PROGRAM
4010 READ A$
4020 IF A$="999" THEN 20000
4030 IF A$="%" THEN GOTO 4110
4040 LE=LEN(A$)
4050 FOR I=1 TO LE
4060 IF A$(I,I)="&" THEN A$(I,I)=","
4070 PRINT A$(I,I);
4080 FOR J=1 TO SP
4090 NEXT J
4100 NEXT I
4110 PRINT
4120 GOTO 4010
18000 REM SCROLL
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM DELAY
19010 FOR I=1 TO D
19020 NEXT I
19030 RETURN
20000 REM CLOSING
20010 PRINT
20020 PRINT "THE END"
20030 END
```

TABLE OF VARIABLES

```
A$
   1010    4010    4020    4030    4040    4060
   4060    4070

L
   2010    2040    2180    2260    18010

D
   2060    2240    19010

SA
   2200    2210

SP
   2210    4080

LE
   4040    4050

I
   4050    4060    4060    4060    4060    4070
   4070    4100    18010   18030   19010   19020
```

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM    STORY TELLER BY GARY ORWIG
500 DATA  "'WILL YOU WALK INTO MY PARLOR?' SAID"
502 DATA  "THE SPIDER TO THE FLY -"
504 DATA  "'TIS THE PRETTIEST LITTLE PARLOR THAT"
506 DATA  "EVER YOU DID SPY."
508 DATA  "THE WAY INTO MY PARLOR IS UP A WINDING"
510 DATA  "STAIR;"
512 DATA  "AND I HAVE MANY CURIOUS THINGS TO SHOW"
514 DATA  "YOU WHEN YOU'RE THERE.'"
516 DATA  " "
518 DATA   "'OH,NO,NO,'SAID THE LITTLE FLY;"
520 DATA  "'TO ASK ME IS IN VAIN;"
522 DATA  "FOR WHO GOES UP YOUR WINDING STAIR"
524 DATA  "CAN NE'ER COME DOWN AGAIN.'"
526 DATA   " "
528 DATA   "'I'M SURE YOU MUST BE WEARY, DEAR,"
530 DATA  "WITH SOARING UP SO HIGH;"
532 DATA  "WILL YOU NOT REST UPON MY LITTLE BED?'"
534 DATA  "SAID THE SPIDER TO THE FLY."
536 DATA   "'THERE ARE PRETTY CURTAINS DRAWN AROUND;"
538 DATA  "THE SHEETS ARE FINE AND THIN;"
540 DATA  "AND IF YOU LIKE TO REST AWHILE,"
542 DATA  "I'LL SNUGLY TUCK YOU IN!'"
544 DATA  " "
546 DATA  "'OH, NO, NO,' SAID THE LITTLE FLY;"
548 DATA  "'FOR I'VE OFTEN HEARD 1 SAID,"
550 DATA  "THEY NEVER, NEVER WAKE AGAIN,"
552 DATA  "WHO SLEEP UPON YOUR BED!'"
554 DATA  " "
556 DATA  "SAID THE CUNNING SPIDER TO THE FLY -"
558 DATA  "'DEAR FRIEND, WHAT CAN I DO"
560 DATA  "TO PROVE THE WARM AFFECTION I'VE ALWAYS"
562 DATA  "FELT FOR YOU?'"
564 DATA  " "
566 DATA  "'I THANK YOU, GENTLE SIR,' SHE SAID,"
568 DATA  "'FOR WHAT YOU'RE PLEASED TO SAY,"
570 DATA  "AND BIDDING YOU GOOD MORNING NOW,"
572 DATA  "I'LL CALL ANOTHER DAY.'"
574 DATA  " "
576 DATA  "THE SPIDER TURNED HIM ROUND ABOUT"
578 DATA  "AND WENT INTO HIS DEN,"
580 DATA  "FOR WELL HE KNEW THE SILLY FLY"
582 DATA  "WOULD SOON COME BACK AGAIN;"
584 DATA  "SO HE WOVE A SUBTLE WEB"
586 DATA  "IN A LITTLE CORNER SLY,"
588 DATA  "AND SET HIS TABLE READY, TO DINE"
590 DATA  "UPON THE FLY."
592 DATA  " "
594 DATA  "THEN HE CAME OUT TO HIS DOOR AGAIN,"
596 DATA  "AND MERRILY DID SING -"
```

```
598 DATA  "'COME HITHER, HITHER, PRETTY FLY,"
600 DATA "WITH THE PEARL AND SILVER WING;"
602 DATA "YOUR ROBES ARE GREEN AND PURPLE -"
604 DATA "THERE'S A CREST UPON YOUR HEAD!"
606 DATA "YOUR EYES ARE LIKE THE DIAMOND BRIGHT"
608 DATA "BUT MINE ARE DULL AS LEAD!'"
610 DATA " "
612 DATA "ALAS! ALAS! HOW VERY SOON"
614 DATA "THIS SILLY LITTLE FLY,"
616 DATA "HEARING HIS WILY, FLATTERING WORDS"
618 DATA "CAME SLOWLY FLITTING BY."
620 DATA "WITH BUZZING WINGS SHE HUNG ALOFT,"
622 DATA "THEN NEAR AND NEARER DREW;"
624 DATA "THINKING ONLY OF HER BRILLIANT EYES,"
626 DATA "HER GREEN AND PURPLE HUE -"
628 DATA "THINKING ONLY OF HER CRESTED HEAD -"
630 DATA "POOR FOOLISH THING!  AT LAST,"
632 DATA "UP JUMPED THE CUNNING SPIDER,"
634 DATA "AND FIRMLY HELD HER FAST!"
636 DATA "  "
638 DATA "HE DRAGGED HER UP HIS WINDING STAIR,"
640 DATA "INTO HIS DISMAL DEN,"
642 DATA "WITHIN HIS LITTLE PARLOR -"
644 DATA "BUT SHE NE'ER CAME OUT AGAIN!"
646 DATA " "
648 DATA " "
650 DATA "AND NOW, DEAR LITTLE CHILDREN,"
652 DATA "WHO MAY THIS STORY READ,"
654 DATA "TO IDLE, SILLY, FLATTERING WORDS,"
656 DATA "I PRAY YOU NE'ER GIVE HEED;"
658 DATA "UNTO AN EVIL COUNSELOR CLOSE HEART,"
660 DATA "AND EAR, AND EYE,"
662 DATA "AND TAKE A LESSON FROM THIS TALE"
664 DATA "OF THE SPIDER AND THE FLY!"
666 DATA  999
1000 REM INITIALIZE
1010 REM USE FULL SCREEN
1020 POKE 82,0
1030 CLS
2000 REM   INTRODUCTION
2010 L = 24
2020 GOSUB 18000
2030 PRINT "            STORY TELLER"
2040 L = 12
2050 GOSUB 18000
2060 D = 1000
2070 GOSUB 19000
2080 GOSUB 18000
2090 PRINT "THIS IS A PROGRAM WHICH TELLS"
2100 PRINT "YOU A STORY.  DO YOU WANT TO READ"
2110 PRINT
2120 PRINT "        1. FAST"
2130 PRINT "        2. MEDIUM"
2140 PRINT "        3. SLOW"
2150 PRINT
2160 PRINT "TYPE IN A NUMBER AND PRESS"
```

```
2170 PRINT "THE 'RETURN'"
2180 L = 8
2190 GOSUB 18000
2200 INPUT SA
2210 SP = SA * 25
2220 PRINT
2230 PRINT "OK! HERE WE GO!"
2240 D = 1000
2250 GOSUB 19000
2260 L = 24
2270 GOSUB 18000
4010 READ A$
4020 IF A$ = "999" THEN 20000
4030 LE =  LEN (A$)
4040 FOR I = 1 TO LE
4050 PRINT  MID$ (A$,I,1);
4060 FOR J = 1 TO SP
4070 NEXT J
4080 NEXT I
4090 PRINT
4100 GOTO 4010
18000 REM  SCROLL
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM  DELAY
19010 FOR I = 1 TO D
19020 NEXT I
19030 RETURN
20000 REM  CLOSING
20010 PRINT
20020 PRINT "THE END"
20030 END
```

TABLE OF VARIABLES

```
A$ - ONE LINE OF STORY
4010 4020 4030 4050

D - DELAY
2060 2240 19010

I - COUNTER
4040 4050 4080 18010 18030
19010 19020

J - COUNTER
4060 4070

L - LINES OF SCROLLING
2010 2040 2180 2260 18010

LE - LENGTH OF LINE A$
4030 4040
```

SA - STUDENT ANSWER
2200 2210

SP - SPEED OF PRINT
2210 4060

END OF VAR. LIST

SAMPLE RUN

THIS IS A PROGRAM WHICH TELLS
YOU A STORY. DO YOU WANT TO READ

       1. FAST
       2. MEDIUM
       3. SLOW

TYPE IN A NUMBER AND PRESS
THE 'RETURN' KEY TO CONTINUE.

?1

OK! HERE WE GO!

'WILL YOU WALK INTO MY PARLOR?' SAID
THE SPIDER TO THE FLY -
'TIS THE PRETTIEST LITTLE PARLOR THAT
EVER YOU DID SPY.
THE WAY INTO MY PARLOR IS UP A WINDING
STAIR;
AND I HAVE MANY CURIOUS THINGS TO SHOW
YOU WHEN YOU'RE THERE.'

'OH,NO,NO,'SAID THE LITTLE FLY;
'TO ASK ME IS IN VAIN;
FOR WHO GOES UP YOUR WINDING STAIR
CAN NE'ER COME DOWN AGAIN.'

'I'M SURE YOU MUST BE WEARY, DEAR,
WITH SOARING UP SO HIGH;
WILL YOU NOT REST UPON MY LITTLE BED?'
SAID THE SPIDER TO THE FLY.
'THERE ARE PRETTY CURTAINS DRAWN AROUND;
THE SHEETS ARE FINE AND THIN;
AND IF YOU LIKE TO REST AWHILE,
I'LL SNUGLY TUCK YOU IN!'

'OH, NO, NO,' SAID THE LITTLE FLY;
'FOR I'VE OFTEN HEARD IT SAID,
THEY NEVER, NEVER WAKE AGAIN,
WHO SLEEP UPON YOUR BED!'

SAID THE CUNNING SPIDER TO THE FLY -

'DEAR FRIEND, WHAT CAN I DO
TO PROVE THE WARM AFFECTION I'VE ALWAYS
FELT FOR YOU?'

'I THANK YOU, GENTLE SIR,' SHE SAID,
'FOR WHAT YOU'RE PLEASED TO SAY,
AND BIDDING YOU GOOD MORNING NOW,
I'LL CALL ANOTHER DAY.'

THE SPIDER TURNED HIM ROUND ABOUT
AND WENT INTO HIS DEN,
FOR WELL HE KNEW THE SILLY FLY
WOULD SOON COME BACK AGAIN;
SO HE WOVE A SUBTLE WEB
IN A LITTLE CORNER SLY,
AND SET HIS TABLE READY, TO DINE
UPON THE FLY.

THEN HE CAME OUT TO HIS DOOR AGAIN,
AND MERRILY DID SING -
'COME HITHER, HITHER, PRETTY FLY,
WITH THE PEARL AND SILVER WING;
YOUR ROBES ARE GREEN AND PURPLE -
THERE'S A CREST UPON YOUR HEAD!
YOUR EYES ARE LIKE THE DIAMOND BRIGHT
BUT MINE ARE DULL AS LEAD!'

ALAS! ALAS! HOW VERY SOON
THIS SILLY LITTLE FLY,
HEARING HIS WILY, FLATTERING WORDS
CAME SLOWLY FLITTING BY.
WITH BUZZING WINGS SHE HUNG ALOFT,
THEN NEAR AND NEARER DREW;
THINKING ONLY OF HER BRILLIANT EYES,
HER GREEN AND PURPLE HUE -
THINKING ONLY OF HER CRESTED HEAD -
POOR FOOLISH THING! AT LAST,
UP JUMPED THE CUNNING SPIDER,
AND FIRMLY HELD HER FAST!

HE DRAGGED HER UP HIS WINDING STAIR,
INTO HIS DISMAL DEN,
WITHIN HIS LITTLE PARLOR -
BUT SHE NE'ER CAME OUT AGAIN!

AND NOW, DEAR LITTLE CHILDREN,
WHO MAY THIS STORY READ,
TO IDLE, SILLY, FLATTERING WORDS,
I PRAY YOU NE'ER GIVE HEED;
UNTO AN EVIL COUNSELOR CLOSE HEART,
AND EAR, AND EYE,
AND TAKE A LESSON FROM THIS TALE
OF THE SPIDER AND THE FLY!

THE END

Synonyms/
Antonyms

PROGRAM DESCRIPTION

This program is a word game to learn the differences between synonyms and antonyms. The computer will first define a synonym and an antonym for the purposes of the program. Then a list of words is chosen by the computer with synonyms or antonyms mixed in with the selected words. The computer does not tell you whether there are synonyms or antonyms in the list of words; you do, however, have the option of selecting the number of paired words (synonyms or antonyms) within the list. By using multiple-choice questions, the computer asks you to select either synonyms or antonyms that are hidden in the list of words. You need to know the definitions of all the words in the list, because you have to answer all of the questions correctly in order to finish the program.

PROGRAM NOTES

1. If you prefer, you can announce whether the student should look for a synonym or an antonym. This would require another array, which would contain the necessary information for each problem.

2. Consider adding homonyms to the program.

PROGRAM LISTING: BASIC

```
100 REM SYNONYMS-ANTONYMS BY GARY ORWIG
500 REM PUT MESSAGE ON SCREEN
510 PRINT
520 PRINT "PLEASE WAIT FOR A MOMENT!"
530 PRINT "I AM READING DATA STATEMENTS."
1000 REM INITIALIZATION - SET 'TL' EQUAL TO THE NUMBER OF PR
OBLEMS IN YOUR DATA SET.
1010 TL=20
1020 BL=TL
1030 LN=1
1040 TL=TL+1
1050 DIM Q$(TL*20),A1$(TL*20),A2$(TL*20),A3$(TL*20),A4$(TL*2
0),KE(TL)
1060 DIM QI$(20),A1I$(20),A2I$(20),A3I$(20),A4I$(20)
1070 DIM NA$(30),S$(5)
1080 FOR I=1 TO TL
1090 Q$(I*20-19,I*20)="                        "
1100 NEXT I
1102 A1$=Q$:A2$=Q$:A3$=Q$:A4$=Q$
1110 FOR I=1 TO TL
1120 READ QI$,A1I$,A2I$,A3I$,A4I$,KE
1130 Q$(LN)=QI$
1140 A1$(LN)=A1I$
1150 A2$(LN)=A2I$
1160 A3$(LN)=A3I$
1170 A4$(LN)=A4I$
1180 KE(I)=KE
1190 LN=LN+20
1200 NEXT I
1210 TL=TL-1
1220 REM USE FULL SCREEN
1230 POKE 82,0
1240 PRINT
2000 REM INTRODUCTION
2010 FOR I=1 TO 50
2020 PRINT "SYNONYMS - ANTONYMS            ";
2030 NEXT I
2040 D=200
2050 GOSUB 19000
2060 L=12
2070 GOSUB 18000
2080 PRINT "WHAT IS YOUR NAME?"
2090 GOSUB 18000
2100 INPUT NA$
2110 PRINT
2120 PRINT
2130 PRINT "I'M HAPPY TO MEET YOU, ";NA$;"."
2140 PRINT
2150 PRINT
2160 PRINT "THIS IS A GAME OF SYNONYMS"
2170 PRINT "AND ANTONYMS."
2180 PRINT
2190 PRINT "DO YOU NEED INSTRUCTIONS?"
2200 PRINT "TYPE IN A YES OR A NO."
```

```
2210 INPUT S$
2220 IF S$="NO" THEN 2420
2230 GOSUB 18000
2240 PRINT "THIS IS REALLY PRETTY EASY, ";NA$;"."
2250 PRINT
2260 PRINT "A 'SYNONYM' IS A WORD WHICH MEANS"
2270 PRINT "ABOUT THE SAME THING AS ANOTHER WORD."
2280 PRINT "FOR EXAMPLE, 'FAST' AND 'SWIFT' "
2290 PRINT "ARE SYNONYMS.  THEY MEAN ABOUT THE"
2300 PRINT "SAME THING."
2310 PRINT
2320 PRINT "ANTONYMS, ON THE OTHER HAND, ARE"
2330 PRINT "OPPOSITES.  FOR EXAMPLE, 'FAST' AND"
2340 PRINT "'SLOW' ARE ANTONYMS.  THEY MEAN"
2350 PRINT "OPPOSITE THINGS."
2360 PRINT
2370 PRINT
2380 PRINT "LET'S TRY SOME GROUPS OF WORDS."
2390 PRINT "FOR EACH WORD AT THE TOP, TRY TO"
2400 PRINT "PICK A SYNONYM OR ANTONYM FROM THE"
2410 PRINT "LIST. "
2420 PRINT
2430 PRINT "READY?  PUSH THE 'RETURN'"
2440 PRINT "KEY TO BEGIN."
2450 INPUT S$
4000 REM MAIN PROGRAM
4010 GOSUB 10000
4020 GOSUB 17000
4030 PRINT "TYPE IN A 1, 2, 3, OR 4";
4040 INPUT SA
4050 IF SA<1 OR SA>4 THEN 4030
4060 GOSUB 15000
4070 GOSUB 11000
4080 IF HT=1 THEN 4140
4090 GOSUB 14000
4100 PRINT "WE WILL TRY THAT ONE AGAIN LATER!"
4110 D=200
4120 GOSUB 19000
4130 GOTO 4010
4140 GOSUB 12000
4150 D=200
4160 GOSUB 19000
4170 REM DELETE CORRECT WORDS FROM LIST
4180 Q$(BW,EW)=Q$(BL*20-19,BL*20)
4190 A1$(BW,EW)=A1$(BL*20-19,BL*20)
4200 A2$(BW,EW)=A2$(BL*20-19,BL*20)
4210 A3$(BW,EW)=A3$(BL*20-19,BL*20)
4220 A4$(BW,EW)=A4$(BL*20-19,BL*20)
4230 KE(R)=KE(BL)
4240 BL=BL-1
4250 IF BL=0 THEN GOTO 20000
4260 GOTO 4010
10000 REM RANDOMIZATION
10010 R=INT(RND(0)*BL)+1
10020 BW=R*20-19
10030 EW=R*20
```

```
10040 RETURN
11000 REM JUDGE ANSWER
11010 IF SA=KE(R) THEN 11040
11020 HT=0
11030 RETURN
11040 HT=1
11050 RETURN
12000 REM REWARD
12010 PRINT
12020 PRINT "GREAT!"
12030 PRINT
12040 RETURN
14000 REM WRONG
14010 PRINT
14020 PRINT "SORRY!"
14030 PRINT
14040 RETURN
15000 REM SCORE KEEPING
15010 N=N+1
15020 RETURN
17000 REM PRINT OUT PROBLEM
17010 L=12
17020 GOSUB 18000
17030 PRINT Q$(BW,EW)
17040 PRINT
17050 PRINT "      1. ";A1$(BW,EW)
17060 PRINT "      2. ";A2$(BW,EW)
17070 PRINT "      3. ";A3$(BW,EW)
17080 PRINT "      4. ";A4$(BW,EW)
17090 L=8
17100 GOSUB 18000
17110 RETURN
18000 REM PRINT LINES
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM DELAY
19010 FOR I=1 TO D
19020 NEXT I
19030 RETURN
20000 REM CLOSING
20010 L=12
20020 GOSUB 18000
20030 PRINT "IT TOOK ";N;" TRIES TO GET"
20040 PRINT TL;" PROBLEMS CORRECT!"
20050 END
21000 REM DATA
21010 DATA SHORT,LONG,OPEN,HEAVY,CLOSE,1
21020 DATA SLY,CUNNING,TIRED,PRETTY,GENTLE,1
21030 DATA SHARP,DULL,HOT,AWFUL,FAST,1
21040 DATA SMART,TERRIBLE,CLEVER,HUGE,RAPID,2
21050 DATA ODD,HARSH,EVEN,CORRECT,SMALL,2
21060 DATA ERECT,SLOW,BUILD,REPORT,SOFT,2
21070 DATA SOFT,SWIFT,THICK,FAT,HARD,4
21080 DATA QUICK,GENTLE,CRUEL,SUBTLE,FAST,4
21090 DATA YOUNG,SMART,HAPPY,GAWKY,OLD,4
```

```
21100 DATA KIND,BLUNT,GRACIOUS,REGULAR,SWIFT,2
21110 DATA LITTLE,COLD,ENORMOUS,BULKY,STRONG,2
21120 DATA SLENDER,GENTLE,OBVIOUS,THIN,IDLE,3
21130 DATA HEAVY,SKILLFUL,COMMON,LIGHT,LAME,3
21140 DATA MILD,GHOSTLY,SPACIOUS,CALM,CRAFTY,3
21150 DATA FAR,NEAR,DARK,HOLLOW,AFTER,1
21160 DATA DECREASE,APPROACH,TREMBLE,REST,DIMINISH,4
21170 DATA POOR,SICK,EASY,DOWDY,WEALTHY,4
21180 DATA AWKWARD,CLUMSY,AMIABLE,BIG,SLENDER,1
21190 DATA REMEMBER,CLEAR,APPROACH,FORGET,ATTACK,3
21200 DATA PROGRESS,BEWITCH,ADVANCE,SCATTER,DISGUISE,2
21210 REM THIS LINE IS NEEDED TO FILL OUT THE STRINGS
21220 DATA END,END,END,END,END,1
```

TABLE OF VARIABLES

TL

1010	1020	1040	1040	1050	1050
1050	1050	1050	1050	1080	1110
1210	1210	20040			

BL

1020	4180	4180	4190	4190	4200
4200	4210	4210	4220	4220	4230
4240	4240	4250	10010		

LN

1030	1130	1140	1150	1160	1170
1190	1190				

Q$

1050	1090	1102	1102	1102	1102
1130	4180	4180	17030		

A1$

1050	1102	1140	4190	4190	17050

A2$

1050	1102	1150	4200	4200	17060

A3$

1050	1102	1160	4210	4210	17070

A4$

1050	1102	1170	4220	4220	17080

KE(

1050	1180	4230	4230	11010

QI$

1060	1120	1130

A1I$
    1060   1120   1140

A2I$
    1060   1120   1150

A3I$
    1060   1120   1160

A4I$
    1060   1120   1170

NA$
    1070   2100   2130   2240

S$
    1070   2210   2220   2450

I
    1080   1090   1090   1100   1110   1180
    1200   2010   2030   18010   18030   19010
    19020

KE
    1120   1180

D
    2040   4110   4150   19010

L
    2060   17010   17090   18010   20010

SA
    4040   4050   4050   11010

HT
    4080   11020   11040

BW
    4180   4190   4200   4210   4220   10020
    17030   17050   17060   17070   17080

EW
    4180   4190   4200   4210   4220   10030
    17030   17050   17060   17070   17080

R
    4230   10010   10020   10030   11010

N
    15010   15010   20030

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   SYNONYMS-ANTONYMS BY GARY ORWIG
500 REM  RESEED RND
```

```
510 RANDOMIZE
1000 REM    INITIALIZATION - SET 'TL' EQUAL TO THE NUMBER OF
PROBLEMS IN YOUR DATA SET.
1010 TL = 20
1020 BL = TL
1030 DIM Q$(TL),A1$(TL),A2$(TL),A3$(TL),A4$(TL),KE(TL)
1040 FOR I = 1 TO TL
1050 READ Q$(I),A1$(I),A2$(I),A3$(I),A4$(I),KE(I)
1060 NEXT I
1070 REM USE FULL SCREEN
1080 POKE 82,0
1090 CLS
2000 REM    INTRODUCTION
2010 FOR I = 1 TO 15
2020 FOR J = 1 TO 50
2030 NEXT J
2040 PRINT "SYNONYMS - ANTONYMS          ";
2050 NEXT I
2060 D = 2500
2070 GOSUB 19000
2080 L = 12
2090 GOSUB 18000
2100 PRINT "WHAT IS YOUR NAME?"
2110 GOSUB 18000
2120 INPUT NA$
2130 PRINT
2140 PRINT
2150 PRINT "I'M HAPPY TO MEET YOU, ";NA$;"."
2160 PRINT
2170 PRINT
2180 PRINT "THIS IS A GAME OF SYNONYMS"
2190 PRINT "AND ANTONYMS."
2200 PRINT
2210 PRINT "DO YOU NEED INSTRUCTIONS?"
2220 PRINT "TYPE IN A YES OR A NO."
2230 INPUT S$
2240 IF S$ = "NO" THEN 3060
2250 GOSUB 18000
2260 PRINT "THIS IS REALLY PRETTY EASY, ";NA$;"."
2270 PRINT
2280 PRINT "A 'SYNONYM' IS A WORD WHICH MEANS"
2290 PRINT "ABOUT THE SAME THING AS ANOTHER WORD."
2300 PRINT "FOR EXAMPLE, 'FAST' AND 'SWIFT' "
2310 PRINT "ARE SYNONYMS.  THEY MEAN ABOUT THE"
2320 PRINT "SAME THING."
2330 PRINT
2340 PRINT "ANTONYMS, ON THE OTHER HAND, ARE"
2350 PRINT "OPPOSITES.  FOR EXAMPLE, 'FAST' AND"
2360 PRINT "'SLOW' ARE ANTONYMS.  THEY MEAN"
2370 PRINT "OPPOSITE THINGS."
3000 PRINT
3010 PRINT
3020 PRINT "LET'S TRY SOME GROUPS OF WORDS."
3030 PRINT "FOR EACH WORD AT THE TOP, TRY TO"
3040 PRINT "PICK A SYNONYM OR ANTONYM FROM THE"
3050 PRINT "LIST. "
3060 PRINT
```

```
3070 PRINT "READY?  PUSH THE 'RETURN'"
3080 PRINT "KEY TO BEGIN."
3090 INPUT S$
4000 REM  MAIN PROGRAM
4010 GOSUB 10000
4020 GOSUB 17000
4030 PRINT "TYPE IN A 1, 2, 3, OR 4";
4040 INPUT SA
4050 IF SA < 1 OR SA > 4 THEN 4030
4060 GOSUB 15000
4070 GOSUB 11000
4080 IF HT = 1 THEN 4140
4090 GOSUB 14000
4100 PRINT "WE WILL TRY THAT ONE AGAIN LATER!"
4110 D = 2000
4120 GOSUB 19000
4130 GOTO 4010
4140 GOSUB 12000
4150 D = 2000
4160 GOSUB 19000
4170 REM  DELETE CORRECT WORDS FROM LIST
4180 Q$(R) = Q$(BL)
4190 A1$(R) = A1$(BL)
4200 A2$(R) = A2$(BL)
4210 A3$(R) = A3$(BL)
4220 A4$(R) = A4$(BL)
4230 KE(R) = KE(BL)
4240 BL = BL - 1
4250 IF BL = 0 THEN  GOTO 20000
4260 GOTO 4010
10000 REM    RANDOMIZATION
10010 R =  RND(BL)
10020 RETURN
11000 REM  JUDGE ANSWER
11010 IF SA = KE(R) THEN 11040
11020 HT = 0
11030 RETURN
11040 HT = 1
11050 RETURN
12000 REM  REWARD
12010 PRINT
12020 PRINT "GREAT!"
12030 PRINT
12040 RETURN
14000 REM  WRONG
14010 PRINT
14020 PRINT "SORRY!"
14030 PRINT
14040 RETURN
15000 REM  SCORE KEEPING
15010 N = N + 1
15020 RETURN
17000 REM  PRINT OUT PROBLEM
17010 L = 12
17020 GOSUB 18000
17030 PRINT Q$(R)
17040 PRINT
```

```
17050 PRINT "       1. ";A1$(R)
17060 PRINT "       2. ";A2$(R)
17070 PRINT "       3. ";A3$(R)
17080 PRINT "       4. ";A4$(R)
17090 L = 8
17100 GOSUB 18000
17110 RETURN
18000 REM   PRINT LINES
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM   DELAY
19010 FOR I = 1 TO D
19020 NEXT I
19030 RETURN
20000 REM   CLOSING
20010 L = 12
20020 GOSUB 18000
20030 PRINT "IT TOOK ";N;" TRIES TO GET"
20040 PRINT TL;" PROBLEMS CORRECT!"
20050 END
21000 REM   DATA
21010 DATA   SHORT, LONG,OPEN,HEAVY,CLOSE,1
21020 DATA   SLY,CUNNING,TIRED,PRETTY,GENTLE,1
21030 DATA   SHARP,DULL,HOT,AWFUL,FAST,1
21040 DATA   SMART,TERRIBLE,CLEVER,HUGE,RAPID,2
21050 DATA   ODD,HARSH,EVEN,CORRECT,SMALL,2
21060 DATA   ERECT,SLOW,BUILD,REPORT,SOFT,2
21070 DATA   SOFT,SWIFT,THICK,FAT,HARD,4
21080 DATA   QUICK,GENTLE,CRUEL,SUBTLE,FAST,4
21090 DATA   YOUNG,SMART,HAPPY,GAWKY,OLD,4
21100 DATA   KIND,BLUNT,GRACIOUS,REGULAR,SWIFT,2
21110 DATA   LITTLE,COLD,ENORMOUS,BULKY,STRONG,2
21120 DATA   SLENDER,GENTLE,OBVIOUS,THIN,IDLE,3
21130 DATA   HEAVY,SKILLFUL,COMMON,LIGHT,LAME,3
21140 DATA   MILD,GHOSTLY,SPACIOUS,CALM,CRAFTY,3
21150 DATA   FAR,NEAR,DARK,HOLLOW,AFTER,1
21160 DATA   DECREASE,APPROACH,TREMBLE,REST,DIMINISH,4
21170 DATA   POOR,SICK,EASY,DOWDY,WEALTHY,4
21180 DATA   AWKWARD,CLUMSY,AMIABLE,BIG,SLENDER,1
21190 DATA   REMEMBER,CLEAR,APPROACH,FORGET,ATTACK,3
21200 DATA   PROGRESS,BEWITCH,ADVANCE,SCATTER,DISGUISE,2
21210 DATA   LAZY,LITTLE,ACTIVE,DIFFICULT,PRETTY,2
```

TABLE OF VARIABLES

```
A1$(*) - ANSWERS 1
1030 1050 4190 4190 17050

A2$(*) - ANSWERS 2
1030 1050 4200 4200 17060

A3$(*) - ANSWERS 3
1030 1050 4210 4210 17070
```

A4$(*) - ANSWERS 4
1030 1050 4220 4220 17080

BL - BOTTOM OF LIST MARKER
1020 4180 4190 4200 4210 4220
4230 4240 4240 4250 10010

D - DELAY
2060 4110 4150 19010

HT - HIT
4080 11020 11040

I - COUNTER
1040 1050 1050 1050 1050 1050
1050 1060 2010 2050 18010 18030
19010 19020

J - COUNTER
2020 2030

KE(*) - KEYS
1030 1050 4230 4230 11010

L - LINES OF SCROLLING
2080 17010 17090 18010 20010

N - NUMBER OF GUESSES
15010 15010 20030

NA$ - NAME
2120 2150 2260

Q$(*) - QUESTIONS
1030 1050 4180 4180 17030

R - RANDOM NUMBER
4180 4190 4200 4210 4220 4230
10010 11010 17030 17050 17060
17070 17080

S$ - STUDENT ANSWER
2230 2240 3090

SA - STUDENT ANSWER
4040 4050 4050 11010

TL - QUESTIONS IN LIST
1010 1020 1030 1030 1030 1030
1030 1030 1040 20040

END OF VAR. LIST

SAMPLE RUN

WHAT IS YOUR NAME?

?MELISSA

I'M HAPPY TO MEET YOU, MELISSA.

THIS IS A GAME OF SYNONYMS
AND ANTONYMS.

DO YOU NEED INSTRUCTIONS?
TYPE IN A YES OR A NO.
?YES

THIS IS REALLY PRETTY EASY, MELISSA.

A 'SYNONYM' IS A WORD WHICH MEANS
ABOUT THE SAME THING AS ANOTHER WORD.
FOR EXAMPLE, 'FAST' AND 'SWIFT'
ARE SYNONYMS. THEY MEAN ABOUT THE
SAME THING.

ANTONYMS, ON THE OTHER HAND, ARE
OPPOSITES. FOR EXAMPLE, 'FAST' AND
'SLOW' ARE ANTONYMS. THEY MEAN
OPPOSITE THINGS.

LET'S TRY SOME GROUPS OF WORDS.
FOR EACH WORD AT THE TOP, TRY TO
PICK A SYNONYM OR ANTONYM FROM THE
LIST.

READY? PUSH THE 'RETURN'
KEY TO BEGIN.
?

PROGRESS

        1. BEWITCH
        2. ADVANCE
        3. SCATTER
        4. DISGUISE

TYPE IN A 1, 2, 3, OR 4?2

GREAT!

SLENDER

        1. GENTLE
        2. OBVIOUS
        3. THIN
        4. IDLE

TYPE IN A 1, 2, 3, OR 4?3

GREAT!

POOR

      1. SICK
      2. EASY
      3. DOWDY
      4. WEALTHY

TYPE IN A 1, 2, 3, OR 4?4

GREAT!

QUICK

      1. GENTLE
      2. CRUEL
      3. SUBTLE
      4. FAST

TYPE IN A 1, 2, 3, OR 4?1

SORRY!

WE WILL TRY THAT ONE AGAIN LATER!

Test Tutor

PROGRAM DESCRIPTION

This program provides an instructor-made data base for developing a review test on any subject. The instructor can insert multiple-choice questions, answers, and explanations to the answers. If you answer a question correctly you have a choice either to go on to the next question or to receive an explanation of the answer. If you answer the question incorrectly, however, you automatically receive an explanation of the answer and the computer will ask you the same question again at a later time during the review test. You must complete all of the questions correctly before you can finish the program.

PROGRAM NOTES

1. The large spaces in the DATA statements are due to the 40 character per line spacing of the computer. If you don't space over the 40th character position, the computer will "break" a word over two lines.

2. Consider using A, B, C, or D for the multiple choice answers.

3. You can enter your own questions. Just look at the DATA statements. There are three for each problem: the question, the selections (with key), and the explanation.

```
100 REM TEST TUTOR BY GARY ORWIG
1000 REM INITIALIZATION - SET 'TL' EQUAL TO THE NUMBER OF PR
OBLEMS IN YOUR DATA SET.
1010 TL=10
1020 DIM Q$(120),A1$(40),A2$(40),A3$(40),A4$(40),KE(TL),EX$(
120)
1030 DIM NA$(30),S$(5)
1040 REM USE FULL SCREEN
1050 POKE 82,0
1060 PRINT
1070 REM SET ARRAY TO 0
1080 FOR I=1 TO TL
1090 KE(I)=0
1100 NEXT I
2000 REM INTRODUCTION
2010 FOR I=1 TO 50
2020 PRINT "              TEST TUTOR   ";
2030 NEXT I
2040 D=200
2050 GOSUB 19000
2060 L=12
2070 GOSUB 18000
2080 PRINT "WHAT IS YOUR NAME?"
2090 GOSUB 18000
2100 INPUT NA$
2110 PRINT
2120 PRINT
2130 PRINT "I'M HAPPY TO MEET YOU, ";NA$;"."
2140 PRINT
2150 PRINT
2160 PRINT "THIS IS A PROGRAM WHICH WILL HELP"
2170 PRINT "YOU STUDY FOR YOUR TEST!   "
2180 PRINT "I WILL ASK YOU QUESTIONS, AND YOU PICK"
2190 PRINT "THE NUMBER OF THE CORRECT ANSWER."
2200 L=8
2210 GOSUB 18000
2220 PRINT "READY?  PUSH THE 'RETURN'"
2230 PRINT "KEY TO BEGIN."
2240 INPUT S$
4000 REM MAIN PROGRAM
4010 GOSUB 10000
4020 IF KE(NX)=5 THEN 4060
4030 C=0
4040 GOSUB 17000
4050 GOTO 4090
4060 C=C+1
4070 IF C=TL+1 THEN 20000
4080 GOTO 4010
4090 PRINT "TYPE IN A 1, 2, 3, OR 4";
4100 INPUT SA
4110 IF SA<1 OR SA>4 THEN 4090
4120 GOSUB 15000
4130 GOSUB 11000
4140 IF HT=1 THEN 4230
```

```
4150 GOSUB 14000
4160 D=200
4170 GOSUB 19000
4180 GOSUB 6000
4190 PRINT "WE WILL TRY THAT ONE AGAIN LATER!"
4200 D=200
4210 GOSUB 19000
4220 GOTO 4010
4230 GOSUB 12000
4240 D=200
4250 GOSUB 19000
4260 PRINT "WOULD YOU LIKE AN EXPLANATION?"
4270 PRINT "(TYPE IN 'YES' OR 'NO')"
4280 INPUT S$
4290 IF S$="YES" THEN GOSUB 6000
4300 GOTO 4010
6000 REM EXPLANATION
6010 L=24
6020 GOSUB 18000
6030 PRINT EX$
6040 L=12
6050 GOSUB 18000
6060 PRINT "PRESS 'RETURN' TO CONTINUE."
6070 INPUT S$
6080 RETURN
10000 REM SEQUENCE QUESTIONS
10010 NX=NX+1
10020 IF NX<TL+1 THEN 10060
10030 NX=0
10040 RESTORE
10050 GOTO 10010
10060 READ Q$,A1$,A2$,A3$,A4$,KE,EX$
10070 RETURN
11000 REM JUDGE ANSWER
11010 IF SA=KE THEN 11040
11020 HT=0
11030 RETURN
11040 HT=1
11050 KE(NX)=5
11060 RETURN
12000 REM REWARD
12010 PRINT
12020 PRINT "GREAT!"
12030 PRINT
12040 RETURN
14000 REM WRONG
14010 PRINT
14020 PRINT "SORRY!"
14030 PRINT
14040 RETURN
15000 REM SCORE KEEPING
15010 N=N+1
15020 RETURN
17000 REM PRINT OUT PROBLEM
17010 L=12
17020 GOSUB 18000
```

```
17030 PRINT Q$
17040 PRINT
17050 PRINT "      1. ";A1$
17060 PRINT "      2. ";A2$
17070 PRINT "      3. ";A3$
17080 PRINT "      4. ";A4$
17090 L=8
17100 GOSUB 18000
17110 RETURN
18000 REM PRINT LINES
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM DELAY
19010 FOR I=1 TO D
19020 NEXT I
19030 RETURN
20000 REM CLOSING
20010 L=12
20020 GOSUB 18000
20030 PRINT "IT TOOK ";N;" TRIES TO GET"
20040 PRINT TL;" PROBLEMS CORRECT!"
20050 END
21000 REM DATA
21010 DATA THE VOLTAGE ACROSS A 5.0 OHM RESISTANCE IS 10.0 V
OLTS.   WHAT IS THE CURRENT      THROUGH THE RESISTANCE?
21020 DATA .5 AMPS,2 AMPS,50 AMPS,15 AMPS,2
21030 DATA V=I*R   SO I=V/R   I=10/5 = 2 AMPS
21040 DATA THE CURRENT THROUGH A 10.0 OHM RESISTANCE IS MEAS
URED TO BE 11.0 AMPS. WHAT VOLTAGE IS BEING APPLIED?
21050 DATA 21 VOLTS,1.1 VOLTS,110 VOLTS,.9 VOLTS,3
21060 DATA V=I*R   SO V = 11 * 10   WHICH EQUALS       110 VOLTS
21070 DATA HOW MUCH POWER IS USED BY A CIRCUIT       WHICH DRA
WS  5.0 AMPS OF CURRENT WHEN    20.0 VOLTS ARE APPLIED?
21080 DATA 4.0 WATTS,.25 WATTS,25 WATTS,100 WATTS,4
21090 DATA P=VI   SO P = 20 * 5   WHICH IS 100 WATTS.
21100 DATA WHAT IS THE MINIMUM SIZE FUSE REQUIRED  TO SUPPLY
 CURRENT TO A CIRCUIT WHICH USES 300 WATTS AT 10.0 VOLTS?
21110 DATA 3000 AMPS,3 AMPS,.33 AMPS,30 AMPS,4
21120 DATA P=VI   SO I=P/V   I = 300/10   WHICH IS     30 AMPS.
 ANY SMALLER FUSE WILL BURN    OUT.
21130 DATA WHAT IS THE MINIMUM SIZE FUSE REQUIRED   TO SUPPLY
 CURRENT TO A CIRCUIT WHICH     USES 300 WATTS AT 100 VOLTS?
21140 DATA 3000 AMPS,3 AMPS,.33 AMPS,30 AMPS,2
21150 DATA I=P/V SO I = 300/100 WHICH EQUALS 3 AMPS.  AS VOL
TAGE INCREASES LESS CURRENT IS REQUIRED TO SUPPLLY = POWER.
21160 DATA WHAT AMOUNT OF POWER IS CONSUMED BY A    RESISTANC
E OF 100 OHMS WHEN A CURRENT OF 3 AMPS PASSES THROUGH IT?
21170 DATA 33 WATTS, 300 WATTS,900 WATTS,3000 WATTS,3
21180 DATA P=I^2*R   SO P=3 * 3 * 100   WHICH IS 900 WATTS.
21190 DATA HOW MUCH POWER IS CONSUMED BY A CABLE    WHICH HAS
 A RESISTANCE OF 2.0 OHMS AND A VOLTAGE DROP OF 20 VOLTS?
21200 DATA 40 WATTS,10 WATTS,22 WATTS,200 WATTS,4
21210 DATA P=V^2/R   SO P = (20 *20)/2   WHICH IS     200 WATTS
```

```
21220 DATA WHAT VOLTAGE GETS TO A MOTOR IF THE RESIST. OF TH
E SUPPLY CABLE IS 2.0 OHMS AND I = 10 AMPS. SUPPLY = 120V.
21230 DATA 20 VOLTS,80 VOLTS,100 VOLTS,120 VOLTS,3
21240 DATA V=IR   SO V=10 * 2 WHICH IS 20 VOLTS (THE VOLTAGE
LOST IN THE CABLE). 120 - 20 = 100 VOLTS (TO THE MOTOR).
21250 DATA WHAT IS THE TOTAL RESISTANCE OF 3 - 30  OHM RESIS
TORS CONNECTED IN SERIES?
21260 DATA 3 OHMS,10 OHMS,33 OHMS,90 OHMS,4
21270 DATA RT=R1+R2+R3   SO RT = 30 + 30 + 30        WHICH IS
90 OHMS.
21280 DATA WHAT IS THE TOTAL RESISTANCE OF 3 - 30   OHM RESI
STORS CONNECTED IN PARALLEL?
21290 DATA 3 OHMS, 10 OHMS, 33 OHMS, 90 OHMS,2
21300 DATA 1/RT=1/R1 + 1/R2 + 1/R3   SO            1/RT=1/30
 + 1/30 + 1/30   RT=10.
```

TABLE OF VARIABLES

```
TL
   1010    1020    1080    4070    10020   20040


Q$
   1020    10060   17030

A1$
   1020    10060   17050

A2$
   1020    10060   17060

A3$
   1020    10060   17070

A4$
   1020    10060   17080

KE(
   1020    1090    4020    11050

EX$
   1020    6030    10060

NA$
   1030    2100    2130

S$
   1030    2240    4280    4290    6070

I
   1080    1090    1100    2010    2030    18010
   18030   19010   19020
```

O
  1090

D
  2040   4160   4200   4240   19010

L
  2060   2200   6010   6040   17010 17090
  18010 20010

NX
  4020   10010 10010 10020 10030 11050

C
  4030   4060   4060   4070

SA
  4100   4110   4110   11010

HT
  4140   11020 11040

KE
  10060 11010

N
  15010 15010 20030

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   TEST TUTOR BY GARY ORWIG
1000 REM    INITIALIZATION - SET 'TL' EQUAL TO THE NUMBER OF
PROBLEMS IN YOUR DATA SET.
1010 TL = 10
1020 DIM Q$(TL),A1$(TL),A2$(TL),A3$(TL),A4$(TL),KE(TL),EX$(T
L)
1030 FOR I = 1 TO TL
1040 READ Q$(I),A1$(I),A2$(I),A3$(I),A4$(I),KE(I),EX$(I)
1050 NEXT I
1060 REM USE FULL SCREEN
1070 POKE 82,0
1080 CLS
2000 REM   INTRODUCTION
2010 FOR I = 1 TO 15
2020 FOR J = 1 TO 50
2030 NEXT J
2040 PRINT "              TEST TUTOR   ";
2050 NEXT I
2060 D = 2500
2070 GOSUB 19000
2080 L = 12
2090 GOSUB 18000
2100 PRINT "WHAT IS YOUR NAME?"
2110 GOSUB 18000
```

```
2120 INPUT NA$
2130 PRINT
2140 PRINT
2150 PRINT "I'M HAPPY TO MEET YOU, ";NA$;"."
2160 PRINT
2170 PRINT
2180 PRINT "THIS IS A PROGRAM WHICH WILL HELP"
2190 PRINT "YOU STUDY FOR YOUR TEST!   "
2200 PRINT "I WILL ASK YOU QUESTIONS, AND YOU PICK"
2210 PRINT "THE NUMBER OF THE CORRECT ANSWER."
2220 L = 8
2230 GOSUB 18000
2240 PRINT "READY?  PUSH THE 'RETURN'"
2250 PRINT "KEY TO BEGIN."
2260 INPUT S$
4000 REM   MAIN PROGRAM
4010 GOSUB 10000
4020 IF KE(NX) = 5 THEN 4060
4030 C = 0
4040 GOSUB 17000
4050 GOTO 4090
4060 C = C + 1
4070 IF C = TL + 1 THEN 20000
4080 GOTO 4010
4090 PRINT "TYPE IN A 1, 2, 3, OR 4";
4100 INPUT SA
4110 IF SA < 1 OR SA > 4 THEN 4090
4120 GOSUB 15000
4130 GOSUB 11000
4140 IF HT = 1 THEN 4230
4150 GOSUB 14000
4160 D = 1000
4170 GOSUB 19000
4180 GOSUB 6000
4190 PRINT "WE WILL TRY THAT ONE AGAIN LATER!"
4200 D = 1000
4210 GOSUB 19000
4220 GOTO 4010
4230 GOSUB 12000
4240 D = 1000
4250 GOSUB 19000
4260 PRINT "WOULD YOU LIKE AN EXPLANATION?"
4270 PRINT "(TYPE IN 'YES' OR 'NO')"
4280 INPUT S$
4290 IF S$ = "YES" THEN  GOSUB 6000
4300 GOTO 4010
6000 REM   EXPLANATION
6010 L = 24
6020 GOSUB 18000
6030 PRINT EX$(NX)
6040 L = 12
6050 GOSUB 18000
6060 PRINT "PRESS 'RETURN'."
6070 INPUT S$
6080 RETURN
10000 REM   SEQUENCE QUESTIONS
```

```
10010 NX = NX + 1
10020 IF NX < TL + 1 THEN 10050
10030 NX = 0
10040 GOTO 10010
10050 RETURN
11000 REM   JUDGE ANSWER
11010 IF SA = KE(NX) THEN 11040
11020 HT = 0
11030 RETURN
11040 HT = 1
11050 KE(NX) = 5
11060 RETURN
12000 REM   REWARD
12010 PRINT
12020 PRINT "GREAT!"
12030 PRINT
12040 RETURN
14000 REM   WRONG
14010 PRINT
14020 PRINT "SORRY!"
14030 PRINT
14040 RETURN
15000 REM   SCORE KEEPING
15010 N = N + 1
15020 RETURN
17000 REM   PRINT OUT PROBLEM
17010 L = 12
17020 GOSUB 18000
17030 PRINT Q$(NX)
17040 PRINT
17050 PRINT "      1. ";A1$(NX)
17060 PRINT "      2. ";A2$(NX)
17070 PRINT "      3. ";A3$(NX)
17080 PRINT "      4. ";A4$(NX)
17090 L = 8
17100 GOSUB 18000
17110 RETURN
18000 REM   PRINT LINES
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM   DELAY
19010 FOR I = 1 TO D
19020 NEXT I
19030 RETURN
20000 REM   CLOSING
20010 L = 12
20020 GOSUB 18000
20030 PRINT "IT TOOK ";N;" TRIES TO GET"
20040 PRINT TL;" PROBLEMS CORRECT!"
20050 END
21000 REM   DATA
21010 DATA "THE VOLTAGE ACROSS A 5.0 OHM RESISTANCE IS MEASU
RED TO BE 10.0 VOLTS.  WHAT IS  THE CURRENT THROUGH THE RESI
STANCE?"
21020 DATA  .5 AMPS,2 AMPS,50 AMPS,15 AMPS,2
```

```
21030 DATA "V=I*R, SO I=V/R; I=10/5 = 2 AMPS"
21040 DATA "THE CURRENT THROUGH A 10.0 OHM RESISTANCE IS MEA
SURED TO BE 11.0 AMPS. WHAT VOLTAGE IS BEING APPLIED?"
21050 DATA 21 VOLTS, 1.1 VOLTS, 110 VOLTS,.9 VOLTS, 3
21060 DATA "V=I*R, SO V = 11 * 10, WHICH EQUALS      110 VOLT
S"
21070 DATA "HOW MUCH POWER IS USED BY A CIRCUIT      WHICH DR
AWS  5.0 AMPS OF CURRENT WHEN   20.0 VOLTS ARE APPLIED?"
21080 DATA 4.0 WATTS,.25 WATTS,25 WATTS,100 WATTS,4
21090 DATA "P=VI, SO P = 20 * 5, WHICH IS 100 WATTS."
21100 DATA "WHAT IS THE MINIMUM SIZE FUSE REQUIRED  TO SUPPL
Y CURRENT TO A CIRCUIT WHICH    USES 300 WATTS AT 10.0 VOLTS
?"
21110 DATA 3000 AMPS,3 AMPS,.33 AMPS,30 AMPS,4
21120 DATA "P=VI, SO I=P/V; I = 300/10, WHICH IS    30 AMPS.
   ANY SMALLER FUSE WILL BURN    OUT."
21130 DATA "WHAT IS THE MINIMUM SIZE FUSE REQUIRED  TO SUPPL
Y CURRENT TO A CIRCUIT WHICH    USES 300 WATTS AT 100 VOLTS?
"
21140 DATA 3000 AMPS,3 AMPS,.33 AMPS,30 AMPS,2
21150 DATA "I=P/V, SO I=300/100 WHICH = 3 AMPS. AS VOLTAGE I
NCREASES, LESS CURRENT IS REQUIRED FOR SAME LEVEL OF POWER."
21160 DATA "WHAT AMOUNT OF POWER IS CONSUMED BY A   RESISTAN
CE OF 100 OHMS WHEN A CURRENT   OF 3 AMPS IS PASSING THROUGH
   IT?"
21170 DATA 33 WATTS, 300 WATTS,900 WATTS,3000 WATTS,3
21180 DATA "P=I^2*R, SO P=3 * 3 * 100, WHICH IS 900 WATTS."
21190 DATA "HOW MUCH POWER IS USED BY A CABLE WHICH HAS A RE
SISTANCE OF 2.0 OHMS WHIT A VOLTAGE DROP OF 20.0 VOLTS?"
21200 DATA 40 WATTS,10 WATTS,22 WATTS,200 WATTS,4
21210 DATA "P=V^2/R, SO P = (20 *20)/2, WHICH IS    200 WATT
S."
21220 DATA "POWER SUPPLY = 120 VOLTS. WHAT VOLTAGE IS SUPPLI
ED TO MOTOR IF CURRENT IS 10 AMPS AND CABLE RESIS. IS 2 OHMS
21230 DATA 20 VOLTS,80 VOLTS, 100 VOLTS, 120 VOLTS,3
21240 DATA "V=IR SO V=10*2=20 VOLTS LOST IN CABLE. 120-20 LE
AVES 100 VOLTS FOR MOTOR."
21250 DATA "WHAT IS THE TOTAL RESISTANCE OF 3, 30   OHM RESI
STORS CONNECTED IN SERIES?"
21260 DATA 3 OHMS,10 OHMS,33 OHMS,90 OHMS,4
21270 DATA "RT=R1+R2+R3, SO RT = 30 + 30 + 30,      WHICH IS
   90 OHMS."
21280 DATA "WHAT IS THE TOTAL RESISTANCE OF 3, 30   OHM RESI
STORS CONNECTED IN PARALLEL?"
21290 DATA 3 OHMS, 10 OHMS, 33 OHMS, 90 OHMS,2
21300 DATA "1/RT=1/R1 + 1/R2 + 1/R3, SO              1/RT=1/3
0 + 1/30 + 1/30; RT=10."
```

TABLE OF VARIABLES

A1$(*) — ANSWER 1
1020 1040 17050

A2$(*) — ANSWER 2
1020 1040 17060

A3$(*) - ANSWER 3
1020 1040 17070

A4$(*) - ANSWER 4
1020 1040 17080

C - NUMBER OF QUESTIONS ANSWERED
4030 4060 4060 4070

D - DELAY
2060 4160 4200 4240 19010

EX$(*) - EXPLANATIONS
1020 1040 6030

HT - HIT
4140 11020 11040

I - COUNTER
1030 1040 1040 1040 1040 1040
1040 1040 1050 2010 2050 18010
18030 19010 19020

J - COUNTER
2020 2030

KE(*) - KEYS
1020 1040 4020 11010 11050

L - LINES OF SCROLLING
2080 2220 6010 6040 17010 17090
18010 20010

N - NUMBER OF TRIES
15010 15010 20030

NA$ - NAME
2120 2150

NX - NUMBER IN SEQUENCE
4020 6030 10010 10010 10020
10030 11010 11050 17030 17050
17060 17070 17080

Q$(*) - QUESTIONS
1020 1040 17030

S$ - STUDENT ANSWER
2260 4280 4290 6070

SA - STUDENT ANSWER
4100 4110 4110 11010

TL - QUESTIONS IN LIST
1010 1020 1020 1020 1020 1020
1020 1020 1030 4070 10020 20040

130   END OF VAR. LIST

SAMPLE RUN

WHAT IS YOUR NAME?

?SANDY

I'M HAPPY TO MEET YOU, SANDY.

THIS IS A PROGRAM WHICH WILL HELP
YOU STUDY FOR YOUR TEST!
I WILL ASK YOU QUESTIONS, AND YOU PICK
THE NUMBER OF THE CORRECT ANSWER.

READY? PUSH THE 'RETURN'
KEY TO BEGIN.
?

THE VOLTAGE ACROSS A 5.0 OHM RESISTANCE IS MEASURED TO BE 10
.0 VOLTS. WHAT IS THE CURRENT THROUGH THE RESISTANCE?

        1. .5 AMPS
        2. 2 AMPS
        3. 50 AMPS
        4. 15 AMPS

TYPE IN A 1, 2, 3, OR 4?2

GREAT!

WOULD YOU LIKE AN EXPLANATION?
(TYPE IN 'YES' OR 'NO')
?NO

THE CURRENT THROUGH A 10.0 OHM   RESISTANCE IS MEASUR
ED TO BE 11.0 AMPS. WHAT VOLTAGE IS BEING APPLIED TO THE
RESISTANCE?

        1. 21 VOLTS
        2. 1.1 VOLTS
        3. 110 VOLTS
        4. .9 VOLTS

TYPE IN A 1, 2, 3, OR 4?1

SORRY!

V=I*R, SO V = 11 * 10, WHICH EQUALS   110 VOLTS   131

PRESS 'RETURN' TO CONTINUE.
?
WE WILL TRY THAT ONE AGAIN LATER!

HOW MUCH POWER IS USED BY A CIRCUIT   WHICH DRAWS 5.0 AMP
S OF CURRENT WHEN   20.0 VOLTS ARE APPLIED?

          1. 4.0 WATTS
          2. .25 WATTS
          3. 25 WATTS
          4. 100 WATTS

TYPE IN A 1, 2, 3, OR 4?4

GREAT!

WOULD YOU LIKE AN EXPLANATION?
(TYPE IN 'YES' OR 'NO')
?YES

P=VI, SO P = 20 * 5, WHICH IS 100 WATTS.

PRESS 'RETURN' TO CONTINUE.
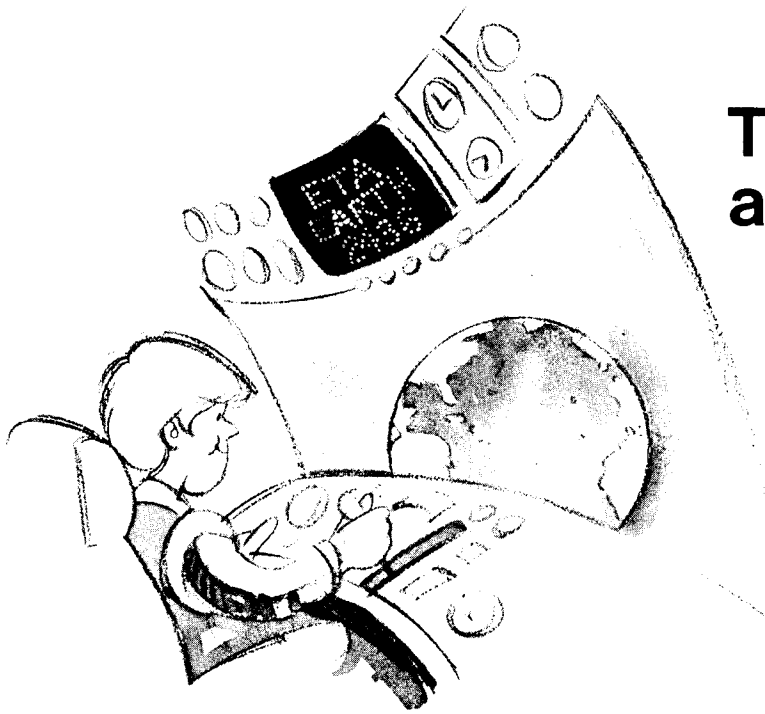
Time, Distance, and Velocity

PROGRAM DESCRIPTION

This program studies the mathematical relationships between time, distance, and velocity. It allows the user to enter values for any two variables, and it will then calculate the value of the third variable.

PROGRAM NOTES

This program is only a shell to work around. Depending on your particular application, you may want to use only the conversion routines, or you may want to add more instruction and de-emphasize these routines.

If you are really into program-writing, try to allow for the input of mixed units such as 3 hours, 15 minutes, and 25 seconds!

PROGRAM LISTING: BASIC

```
100 REM TIME DISTANCE AND VELOCITY BY GARY ORWIG
500 REM PRINT MESSAGE
510 PRINT
520 PRINT "ONE MOMENT PLEASE!"
1000 REM INITIALIZATION
1010 DIM A$(6*15),A(5,5),B$(7*15),B(6,6)
1020 DIM AI$(15),BI$(15)
1030 DIM NA$(30),S$(5)
1040 FOR I=1 TO 5
1050 FOR J=1 TO 5
1060 READ A
```

133

```
1070 A(I,J)=A
1080 NEXT J
1090 NEXT I
1100 LN=1
1110 FOR I=1 TO 5*15
1120 A$(I,I)=" "
1130 NEXT I
1140 FOR I=1 TO 6
1150 READ AI$
1160 A$(LN)=AI$
1170 LN=LN+15
1180 NEXT I
1190 FOR I=1 TO 6
1200 FOR J=1 TO 6
1210 READ B
1220 B(I,J)=B
1230 NEXT J
1240 NEXT I
1250 LN=1
1260 FOR I=1 TO 6*15
1270 B$(I,I)=" "
1280 NEXT I
1290 FOR I=1 TO 7
1300 READ BI$
1310 B$(LN)=BI$
1320 LN=LN+15
1330 NEXT I
1340 REM USE FULL SCREEN
1350 POKE 82,0
1360 PRINT
2000 REM INTRODUCTION
2010 FOR I=1 TO 25
2020 FOR J=1 TO I
2030 PRINT " ";
2040 NEXT J
2050 PRINT "TIME"
2060 NEXT I
2070 FOR I=1 TO 25
2080 FOR J=1 TO I
2090 PRINT " ";
2100 NEXT J
2110 PRINT "DISTANCE"
2120 NEXT I
2130 FOR I=1 TO 25
2140 FOR J=1 TO I
2150 PRINT " ";
2160 NEXT J
2170 PRINT "VELOCITY"
2180 NEXT I
2190 D=200
2200 GOSUB 19000
2210 L=24
2220 GOSUB 18000
2230 PRINT "HI! I'M HAPPY TO SEE YOU."
2240 PRINT
2250 PRINT "WHAT IS YOUR NAME?"
2260 L=12
```

```
2270 GOSUB 18000
2280 INPUT NA$
2290 PRINT "IT'S NICE TO MEET YOU, ";NA$;"."
2300 PRINT
2310 PRINT
2320 PRINT "IN THIS PROGRAM WE ARE GOING TO"
2330 PRINT "STUDY TIME, DISTANCE, AND"
2340 PRINT "VELOCITY.  "
2350 PRINT
2360 PRINT
2370 PRINT "FIRST, LET'S WORK WITH TIME."
2380 PRINT "TIME CAN BE MEASURED IN A VARIETY"
2390 PRINT "OF UNITS, INCLUDING SECONDS,"
2400 PRINT "MINUTES, HOURS, AND SO FORTH."
2410 PRINT
2420 PRINT "WE WILL PRACTICE CONVERTING"
2430 PRINT "VALUES FROM ONE TO ANOTHER FOR"
2440 PRINT "A BIT JUST TO GET USED TO THEM."
2450 PRINT
2460 PRINT
2470 PRINT "PRESS THE 'RETURN' KEY TO CONTINUE."
2480 INPUT S$
2490 L=24
2500 GOSUB 18000
4000 REM MAIN PROGRAM
4010 PRINT
4020 PRINT "TYPE IN ONE VALUE AND I WILL CONVERT"
4030 PRINT "IT FOR YOU!"
4040 PRINT
4050 PRINT "TYPE IN A 'O' TO GO ON."
4060 PRINT
4070 PRINT
4080 PRINT "CHANGE FROM (PICK A NUMBER)"
4090 PRINT
4100 GOSUB 9010
4110 INPUT TU
4120 IF TU=0 THEN 5000
4130 PRINT
4140 PRINT "CHANGE FROM ";A$(TU*15-14,TU*15)
4150 PRINT "TO"
4160 PRINT "(PICK A NUMBER)"
4170 PRINT
4180 GOSUB 9010
4190 INPUT T2
4200 PRINT
4210 PRINT "CHANGE FROM ";A$(TU*15-14,TU*15)
4220 PRINT "TO"
4230 PRINT A$(T2*15-14,T2*15)
4240 PRINT
4250 PRINT "HOW MANY ";A$(TU*15-14,TU*15)
4260 INPUT TM
4270 TX=TM*A(TU,T2)
4280 PRINT
4290 PRINT TM;" ";A$(TU*15-14,TU*15)
4300 PRINT "EQUALS ";TX;" ";A$(T2*15-14,T2*15)
4310 GOTO 4040
5000 REM DISTANCE
```

```
5010 L=24
5020 GOSUB 18000
5030 PRINT "DISTANCE IS ALSO MEASURED IN"
5040 PRINT "A VARIETY OF UNITS."
5050 PRINT "AMONG THEM ARE METRIC UNITS"
5060 PRINT "SUCH AS CENTIMETERS, METERS, AND"
5070 PRINT "KILOMETERS.  IN ADDITION, THERE"
5080 PRINT "ARE ENGLISH UNITS SUCH AS FEET"
5090 PRINT "AND MILES."
5100 PRINT
5110 PRINT
5120 PRINT "LET'S PRACTICE CONVERTING SOME"
5130 PRINT "DISTANCES BETWEEN THE VARIOUS UNITS."
5140 PRINT
5150 PRINT "ALTHOUGH IT ISN'T TOO GOOD OF AN"
5160 PRINT "IDEA TO CONVERT BETWEEN ENGLISH AND"
5170 PRINT "METRIC UNITS, I WILL INCLUDE THEM BOTH"
5180 PRINT "FOR YOU TO WORK WITH."
5190 PRINT
5200 PRINT "PUSH 'RETURN' TO CONTINUE."
5210 INPUT S$
5220 L=24
5230 GOSUB 18000
5240 PRINT
5250 PRINT "TYPE IN A '0' TO GO ON."
5260 PRINT
5270 PRINT
5280 PRINT "CHANGE FROM (PICK A NUMBER)"
5290 PRINT
5300 GOSUB 9100
5310 PRINT
5320 INPUT DU
5330 IF DU=0 THEN 6000
5340 PRINT
5350 PRINT "CHANGE FROM ";B$(DU*15-14,DU*15)
5360 PRINT "TO"
5370 PRINT "(PICK A NUMBER)"
5380 PRINT
5390 GOSUB 9100
5400 PRINT
5410 INPUT D2
5420 PRINT
5430 PRINT "CHANGE FROM ";B$(DU*15-14,DU*15)
5440 PRINT "TO"
5450 PRINT B$(D2*15-14,D2*15)
5460 PRINT
5470 PRINT "HOW MANY ";B$(DU*15-14,DU*15)
5480 INPUT DI
5490 DX=DI*B(DU,D2)
5500 PRINT
5510 PRINT DI;" ";B$(DU*15-14,DU*15)
5520 PRINT " EQUALS ";DX;" ";B$(D2*15-14,D2*15)
5530 GOTO 5240
6000 REM VELOCITY
6010 L=24
6020 GOSUB 18000
6030 PRINT "NOW LETS WORK WITH VELOCITY."
```

```
6040 PRINT
6050 PRINT "VELOCITY IS THE DISTANCE COVERED"
6060 PRINT "IN A GIVEN UNIT OF TIME."
6070 PRINT "(LIKE 60 MILES PER HOUR)"
6080 L=10
6090 GOSUB 18000
6100 PRINT "PUSH 'RETURN' TO CONTINUE."
6110 INPUT S$
6120 REM SELECTION
6130 PRINT
6140 PRINT
6150 L=24
6160 GOSUB 18000
6170 PRINT
6180 PRINT "PICK A NUMBER."
6190 PRINT "    1. GIVEN TIME AND DISTANCE,"
6200 PRINT "       FIND VELOCITY."
6210 PRINT
6220 PRINT "    2. GIVEN TIME AND VELOCITY,"
6230 PRINT "       FIND DISTANCE."
6240 PRINT
6250 PRINT "    3. GIVEN VELOCITY AND DISTANCE,"
6260 PRINT "       FIND TIME."
6270 PRINT "TYPE IN A '0' TO GO ON."
6280 INPUT SA
6290 IF SA=0 THEN 20000
6300 ON SA GOTO 7000,7440,8000
7000 L=24
7010 GOSUB 18000
7020 PRINT "FINDING VELOCITY GIVEN"
7030 PRINT "TIME AND DISTANCE"
7040 PRINT
7050 PRINT "WHICH UNIT FOR TIME (PICK A #)"
7060 GOSUB 9010
7070 INPUT TU
7080 PRINT "ENTER VALUE OF ";A$(TU*15-14,TU*15)
7090 INPUT TM
7100 PRINT "WHICH UNIT FOR DISTANCE(PICK A #)"
7110 GOSUB 9120
7120 INPUT DU
7130 PRINT "ENTER VALUE OF ";B$(DU*15-14,DU*15)
7140 INPUT DI
7150 VE=DI/TM
7160 PRINT
7170 PRINT
7180 PRINT "THE ANSWER IS ";VE;" ";B$(DU*15-14,DU*15)
7190 PRINT "PER ";A$(TU*15-14,TU*15)
7200 PRINT
7210 PRINT "WOULD YOU LIKE THE ANSWER TO BE"
7220 PRINT "CONVERTED TO OTHER UNITS?"
7230 PRINT "(YES OR NO)"
7240 INPUT S$
7250 IF S$="YES" THEN 7270
7260 GOTO 6120
7270 PRINT
7280 PRINT "WHAT UNITS OF TIME?"
7290 GOSUB 9010
```

```
7300 INPUT T2
7310 PRINT "WHICH UNITS OF DISTANCE"
7320 GOSUB 9120
7330 INPUT D2
7340 VX=(DI*B(DU,D2))/(TM*A(TU,T2))
7350 PRINT VE;" ";B$(DU*15-14,DU*15)
7360 PRINT "PER ";A$(TU*15-14,TU*15)
7370 PRINT "EQUALS:"
7380 PRINT VX;" ";B$(D2*15-14,D2*15)
7390 PRINT "PER ";A$(T2*15-14,T2*15)
7400 PRINT
7410 PRINT "PUSH RETURN  TO CONTINUE."
7420 INPUT S$
7430 GOTO 6120
7440 REM FIND DISTANCE
7450 L=24
7460 GOSUB 18000
7470 PRINT "FINDING DISTANCE GIVEN"
7480 PRINT "TIME AND VELOCITY"
7490 PRINT
7500 PRINT "WHICH UNIT FOR TIME (PICK A #)"
7510 GOSUB 9010
7520 INPUT TU
7530 PRINT "ENTER VALUE OF ";A$(TU*15-14,TU*15)
7540 INPUT TM
7550 PRINT "WHICH UNIT FOR DISTANCE(PICK A #)"
7560 GOSUB 9120
7570 INPUT DU
7580 PRINT "ENTER VALUE OF VELOCITY IN UNITS OF"
7590 PRINT B$(DU*15-14,DU*15)
7600 PRINT "PER ";A$(TU*15-14,TU*15)
7610 INPUT VE
7620 DI=VE*TM
7630 PRINT
7640 PRINT
7650 PRINT "THE ANSWER IS ";DI;" ";B$(DU*15-14,DU*15)
7660 PRINT
7670 PRINT "WOULD YOU LIKE THE ANSWER TO BE"
7680 PRINT "CONVERTED TO OTHER UNITS?"
7690 PRINT "(YES OR NO)"
7700 INPUT S$
7710 IF S$="YES" THEN 7730
7720 GOTO 6120
7730 PRINT
7740 PRINT "WHAT UNITS OF DISTANCE?"
7750 GOSUB 9120
7760 INPUT D2
7770 DX=(DI*B(DU,D2))
7780 PRINT DI;" ";B$(DU*15-14,DU*15)
7790 PRINT "EQUALS ";DX;" ";B$(D2*15-14,D2*15)
7800 PRINT
7810 PRINT "PUSH 'RETURN' TO CONTINUE."
7820 INPUT S$
7830 GOTO 6120
8000 REM FIND DISTANCE
8010 L=24
8020 GOSUB 18000
```

```
8030 PRINT "FINDING TIME GIVEN"
8040 PRINT "DISTANCE AND VELOCITY"
8050 PRINT
8060 PRINT "WHICH UNIT FOR DISTANCE"
8070 PRINT "(PICK A NUMBER)"
8080 GOSUB 9120
8090 INPUT DU
8100 PRINT "ENTER VALUE OF ";B$(DU*15-14,DU*15)
8110 INPUT DI
8120 PRINT "WHICH UNIT FOR TIME (PICK A #)"
8130 GOSUB 9010
8140 INPUT TU
8150 PRINT "ENTER VALUE OF VELOCITY IN UNITS OF"
8160 PRINT B$(DU*15-14,DU*15)
8170 PRINT "PER ";A$(TU*15-14,TU*15)
8180 INPUT VE
8190 TM=DI/VE
8200 PRINT
8210 PRINT
8220 PRINT "THE ANSWER IS ";TM;" ";A$(TU*15-14,TU*15)
8230 PRINT
8240 PRINT "WOULD YOU LIKE THE ANSWER TO BE"
8250 PRINT "CONVERTED TO OTHER UNITS?"
8260 PRINT "(YES OR NO)"
8270 INPUT S$
8280 IF S$="YES" THEN 8300
8290 GOTO 6120
8300 PRINT
8310 PRINT "WHAT UNITS OF TIME?"
8320 GOSUB 9010
8330 INPUT T2
8340 TX=(TM*A(TU,T2))
8350 PRINT TM;" ";A$(TU*15-14,TU*15)
8360 PRINT "EQUALS ";TX;" ";A$(T2*15-14,T2*15)
8370 PRINT
8380 PRINT "PUSH 'RETURN' TO CONTINUE."
8390 INPUT S$
8400 GOTO 6120
9000 REM PRINT SUBROUTINES
9010 REM TIME
9020 PRINT
9030 FOR I=1 TO 5
9040 BW=I*15-14
9050 EW=I*15
9060 PRINT "          ";I;". ";A$(BW,EW)
9070 NEXT I
9080 PRINT
9090 RETURN
9100 REM DISTANCE
9110 PRINT
9120 FOR I=1 TO 6
9130 BW=I*15-14
9140 EW=I*15
9150 PRINT "          ";I;". ";B$(BW,EW)
9160 NEXT I
9170 PRINT
9180 RETURN
```

```
18000 REM SCROLL
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM DELAY
19010 FOR K=1 TO D
19020 NEXT K
19030 RETURN
20000 REM CLOSING
20010 L=24
20020 GOSUB 18000
20030 PRINT "WE'RE FINISHED, ";NA$;"!"
20040 PRINT "I HOPE YOU HAD A NICE TIME!"
20050 L=12
20060 GOSUB 18000
20070 END
21000 REM START OF DATA
21010 DATA 1,.01667,2.778E-4,1.157E-5,3.169E-8
21020 DATA 60,1,.01667,6.944E-4,1.901E-6
21030 DATA 3600,60,1,.04167,1.141E-4
21040 DATA 86400,1440,24,1,2.738E-3
21050 DATA 31557600,525960,8766,365.25,1
21060 DATA SECONDS,MINUTES,HOURS,DAYS,YEARS,EOF
21070 DATA 1,.1,.001,1.0E-6,3.28084E-3,6.2137E-7
21080 DATA 10,1,.01,1.0E-5,3.28084E-2,6.2137E-6
21090 DATA 1000,100,1,.001,3.28084,6.2137E-4
21100 DATA 1000000,100000,1000,1,3280.84,.62137
21110 DATA 304.8,30.48,.3048,3.048E-4,1,1.894E-4
21120 DATA 1609300,160930,1609.3,1.6093,5280,1
21130 DATA MILLIMETERS,CENTIMETERS,METERS,KILOMETERS,FEET,MI
LES,EOF
```

TABLE OF VARIABLES

A$

1010	1120	1160	4140	4210	4230
4250	4290	4300	7080	7190	7360
7390	7530	7600	8170	8220	8350
8360	9060				

A(

1010	1070	4270	7340	8340

B$

1010	1270	1310	5350	5430	5450
5470	5510	5520	7130	7180	7350
7380	7590	7650	7780	7790	8100
8160	9150				

B(

1010	1220	5490	7340	7770

AI$

1020	1150	1160

BI$
   1020   1300   1310

NA$
   1030   2280   2290   20030

S$
   1030   2480   5210   6110   7240   7250
   7420   7700   7710   7820   8270   8280
   8390

I
   1040   1070   1090   1110   1120   1120
   1130   1140   1180   1190   1220   1240
   1260   1270   1270   1280   1290   1330
   2010   2020   2060   2070   2080   2120
   2130   2140   2180   9030   9040   9050
   9060   9070   9120   9130   9140   9150
   9160   18010 18030

J
   1050   1070   1080   1200   1220   1230
   2020   2040   2080   2100   2140   2160

A
   1060   1070

LN
   1100   1160   1170   1170   1250   1310
   1320   1320

B
   1210   1220

D
   2190   19010

L
   2210   2260   2490   5010   5220   6010
   6080   6150   7000   7450   8010   18010
   20010 20050

TU
   4110   4120   4140   4140   4210   4210
   4250   4250   4270   4290   4290   7070
   7080   7080   7190   7190   7340   7360
   7360   7520   7530   7530   7600   7600
   8140   8170   8170   8220   8220   8340
   8350   8350

T2
   4190   4230   4230   4270   4300   4300
   7300   7340   7390   7390   8330   8340
   8360   8360

TM
```
  4260   4270   4290   7090   7150   7340
  7540   7620   8190   8220   8340   8350
```

TX
```
  4270   4300   8340   8360
```

DU
```
  5320   5330   5350   5350   5430   5430
  5470   5470   5490   5510   5510   7120
  7130   7130   7180   7180   7340   7350
  7350   7570   7590   7590   7650   7650
  7770   7780   7780   8090   8100   8100
  8160   8160
```

D2
```
  5410   5450   5450   5490   5520   5520
  7330   7340   7380   7380   7760   7770
  7790   7790
```

DI
```
  5480   5490   5510   7140   7150   7340
  7620   7650   7770   7780   8110   8190
```

DX
```
  5490   5520   7770   7790
```

SA
```
  6280   6290   6300
```

VE
```
  7150   7180   7350   7610   7620   8180
  8190
```

VX
```
  7340   7380
```

BW
```
  9040   9060   9130   9150
```

EW
```
  9050   9060   9140   9150
```

K
```
  19010  19020
```

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   TIME DISTANCE AND VELOCITY BY GARY ORWIG
1000 REM   INITIALIZATION
1010 DIM A$(5),A(5,5),B$(6),B(6,6)
1020 FOR I = 1 TO 5
1030 FOR J = 1 TO 5
1040 READ A(I,J)
```

```
1050 NEXT J
1060 NEXT I
1070 FOR I = 1 TO 5
1080 READ A$(I)
1090 NEXT I
1100 FOR I = 1 TO 6
1110 FOR J = 1 TO 6
1120 READ B(I,J)
1130 NEXT J
1140 NEXT I
1150 FOR I = 1 TO 6
1160 READ B$(I)
1170 NEXT I
1180 REM USE FULL SCREEN
1190 POKE 82,0
1200 CLS
2000 REM   INTRODUCTION
2010 D = 20
2020 FOR I = 1 TO 25
2030 FOR J = 1 TO I
2040 PRINT " ";
2050 NEXT J
2060 PRINT "TIME"
2070 GOSUB 19000
2080 NEXT I
2090 FOR I = 1 TO 25
2100 FOR J = 1 TO I
2110 PRINT " ";
2120 NEXT J
2130 PRINT "DISTANCE"
2140 GOSUB 19000
2150 NEXT I
2160 FOR I = 1 TO 25
2170 FOR J = 1 TO I
2180 PRINT " ";
2190 NEXT J
2200 PRINT "VELOCITY"
2210 GOSUB 19000
2220 NEXT I
2230 D = 1000
2240 GOSUB 19000
2250 L = 24
2260 GOSUB 18000
2270 PRINT "HI! I'M HAPPY TO SEE YOU."
2280 PRINT
2290 PRINT "WHAT IS YOUR NAME?"
2300 L = 12
2310 GOSUB 18000
2320 INPUT NA$
2330 PRINT "IT'S NICE TO MEET YOU, ";NA$;"."
2340 PRINT
2350 PRINT
2360 PRINT "IN THIS PROGRAM WE ARE GOING TO"
2370 PRINT "STUDY TIME, DISTANCE, AND"
2380 PRINT "VELOCITY.
2390 PRINT
2400 PRINT
```

```
2410 PRINT "FIRST, LET'S WORK WITH TIME."
2420 PRINT "TIME CAN BE MEASURED IN A VARIETY"
2430 PRINT "OF UNITS, INCLUDING SECONDS,"
2440 PRINT "MINUTES, HOURS, AND SO FORTH."
2450 PRINT
2460 PRINT "WE WILL PRACTICE CONVERTING"
2470 PRINT "VALUES FROM ONE TO ANOTHER FOR"
2480 PRINT "A BIT JUST TO GET USED TO THEM."
2490 PRINT
2500 PRINT
2510 PRINT "PRESS THE 'RETURN' KEY."
2520 INPUT S$
2530 L = 24
2540 GOSUB 18000
4000 REM   MAIN PROGRAM
4010 PRINT
4020 PRINT "TYPE IN ONE VALUE AND I WILL CONVERT"
4030 PRINT "IT FOR YOU!"
4040 PRINT
4050 PRINT "TYPE IN A '0' TO GO ON."
4060 PRINT
4070 PRINT
4080 PRINT "CHANGE FROM (PICK A NUMBER)"
4090 PRINT
4100 GOSUB 9010
4110 INPUT TU
4120 IF TU = 0 THEN 5000
4130 PRINT
4140 PRINT "CHANGE FROM ";A$(TU);" TO"
4150 PRINT "(PICK A NUMBER)"
4160 PRINT
4170 GOSUB 9010
4180 INPUT T2
4190 PRINT
4200 PRINT "CHANGE FROM ";A$(TU);" TO"
4210 PRINT A$(T2);"."
4220 PRINT
4230 PRINT "HOW MANY ";A$(TU);"?"
4240 INPUT TM
4250 TX = TM * A(TU,T2)
4260 PRINT
4270 PRINT TM;" ";A$(TU);" EQUALS ";TX;" ";A$(T2);"."
4280 GOTO 4040
5000 REM   DISTANCE
5010 L = 24
5020 GOSUB 18000
5030 PRINT "DISTANCE IS ALSO MEASURED IN"
5040 PRINT "A VARIETY OF UNITS."
5050 PRINT "AMONG THEM ARE METRIC UNITS"
5060 PRINT "SUCH AS CENTIMETERS, METERS, AND"
5070 PRINT "KILOMETERS.  IN ADDITION, THERE"
5080 PRINT "ARE ENGLISH UNITS SUCH AS FEET"
5090 PRINT "AND MILES.
5100 PRINT
5110 PRINT
5120 PRINT "LET'S PRACTICE CONVERTING SOME"
5130 PRINT "DISTANCES BETWEEN THE VARIOUS UNITS."
```

```
5140 PRINT
5150 PRINT "ALTHOUGH IT ISN'T TOO GOOD OF AN"
5160 PRINT "IDEA TO CONVERT BETWEEN ENGLISH AND"
5170 PRINT "METRIC UNITS, I WILL INCLUDE THEM BOTH"
5180 PRINT "FOR YOU TO WORK WITH."
5190 PRINT
5200 PRINT "PUSH THE 'RETURN' KEY."
5210 INPUT S$
5220 L = 24
5230 GOSUB 18000
5240 PRINT
5250 PRINT "TYPE IN A '0' TO GO ON."
5260 PRINT
5270 PRINT
5280 PRINT "CHANGE FROM (PICK A NUMBER)"
5290 PRINT
5300 GOSUB 9080
5310 PRINT
5320 INPUT DU
5330 IF DU = 0 THEN 6000
5340 PRINT
5350 PRINT "CHANGE FROM ";B$(DU);" TO"
5360 PRINT "(PICK A NUMBER)"
5370 PRINT
5380 GOSUB 9080
5390 PRINT
5400 INPUT D2
5410 PRINT
5420 PRINT "CHANGE FROM ";B$(DU);" TO"
5430 PRINT B$(D2);"."
5440 PRINT
5450 PRINT "HOW MANY ";B$(DU);"?"
5460 INPUT DI
5470 DX = DI * B(DU,D2)
5480 PRINT
5490 PRINT DI;" ";B$(DU);" EQUALS ";DX;" ";B$(D2);"."
5500 GOTO 5240
6000 REM   VELOCITY
6010 L = 24
6020 GOSUB 18000
6030 PRINT "NOW LETS WORK WITH VELOCITY."
6040 PRINT
6050 PRINT "VELOCITY IS THE DISTANCE COVERED"
6060 PRINT "IN A GIVEN UNIT OF TIME."
6070 PRINT "(LIKE 60 MILES PER HOUR)"
6080 L = 10
6090 GOSUB 18000
6100 PRINT "PUSH THE 'RETURN' KEY."
6110 INPUT S$
6120 REM   SELECTION
6130 PRINT
6140 PRINT
6150 L = 24
6160 GOSUB 18000
6170 PRINT
6180 PRINT "PICK A NUMBER."
6190 PRINT "     1. GIVEN TIME AND DISTANCE,"
```

```
6200 PRINT "          FIND VELOCITY."
6210 PRINT
6220 PRINT "      2. GIVEN TIME AND VELOCITY,"
6230 PRINT "          FIND DISTANCE."
6240 PRINT
6250 PRINT "      3. GIVEN VELOCITY AND DISTANCE,"
6260 PRINT "          FIND TIME."
6270 PRINT "TYPE IN A '0' TO GO ON."
6280 INPUT SA
6290 IF SA = 0 THEN 20000
6300 ON SA GOTO 7000,7410,8000
7000 L = 24
7010 GOSUB 18000
7020 PRINT "FINDING VELOCITY GIVEN"
7030 PRINT "TIME AND DISTANCE"
7040 PRINT
7050 PRINT "WHICH UNIT FOR TIME (PICK A #)"
7060 GOSUB 9010
7070 INPUT TU
7080 PRINT "ENTER VALUE OF ";A$(TU);"."
7090 INPUT TM
7100 PRINT "WHICH UNIT FOR DISTANCE(PICK A #)"
7110 GOSUB 9100
7120 INPUT DU
7130 PRINT "ENTER VALUE OF ";B$(DU);"."
7140 INPUT DI
7150 VE = DI / TM
7160 PRINT
7170 PRINT
7180 PRINT "THE ANSWER IS ";VE;" ";B$(DU)
7190 PRINT "PER ";A$(TU);"."
7200 PRINT
7210 PRINT "WOULD YOU LIKE THE ANSWER TO BE"
7220 PRINT "CONVERTED TO OTHER UNITS?"
7230 PRINT "(YES OR NO)"
7240 INPUT S$
7250 IF S$ = "YES" THEN 7270
7260 GOTO 6120
7270 PRINT
7280 PRINT "WHAT UNITS OF TIME?"
7290 GOSUB 9010
7300 INPUT T2
7310 PRINT "WHICH UNITS OF DISTANCE"
7320 GOSUB 9100
7330 INPUT D2
7340 VX = (DI * B(DU,D2)) / (TM * A(TU,T2))
7350 PRINT VE;" ";B$(DU);" PER ";A$(TU);" EQUALS:"
7360 PRINT VX;" ";B$(D2);" PER ";A$(T2);"."
7370 PRINT
7380 PRINT "PUSH THE 'RETURN' KEY."
7390 INPUT S$
7400 GOTO 6120
7410 REM  FIND DISTANCE
7420 L = 24
7430 GOSUB 18000
7440 PRINT "FINDING DISTANCE GIVEN"
7450 PRINT "TIME AND VELOCITY"
```

```
7460 PRINT
7470 PRINT "WHICH UNIT FOR TIME (PICK A #)"
7480 GOSUB 9010
7490 INPUT TU
7500 PRINT "ENTER VALUE OF ";A$(TU);"."
7510 INPUT TM
7520 PRINT "WHICH UNIT FOR DISTANCE(PICK A #)"
7530 GOSUB 9100
7540 INPUT DU
7550 PRINT "ENTER VALUE OF VELOCITY IN UNITS OF"
7560 PRINT B$(DU);" PER ";A$(TU);"."
7570 INPUT VE
7580 DI = VE * TM
7590 PRINT
7600 PRINT
7610 PRINT "THE ANSWER IS ";DI;" ";B$(DU);"."
7620 PRINT
7630 PRINT "WOULD YOU LIKE THE ANSWER TO BE"
7640 PRINT "CONVERTED TO OTHER UNITS?"
7650 PRINT "(YES OR NO)"
7660 INPUT S$
7670 IF S$ = "YES" THEN 7690
7680 GOTO 6120
7690 PRINT
7700 PRINT "WHAT UNITS OF DISTANCE?"
7710 GOSUB 9100
7720 INPUT D2
7730 DX = (DI * B(DU,D2))
7740 PRINT DI;" ";B$(DU)
7750 PRINT "EQUALS ";DX;" ";B$(D2);"."
7760 PRINT
7770 PRINT "PUSH THE 'RETURN' KEY."
7780 INPUT S$
7790 GOTO 6120
8000 REM  FIND DISTANCE
8010 L = 24
8020 GOSUB 18000
8030 PRINT "FINDING TIME GIVEN"
8040 PRINT "DISTANCE AND VELOCITY"
8050 PRINT
8060 PRINT "WHICH UNIT FOR DISTANCE"
8070 PRINT "(PICK A NUMBER)"
8080 GOSUB 9100
8090 INPUT DU
8100 PRINT "ENTER VALUE OF ";B$(DU);"."
8110 INPUT DI
8120 PRINT "WHICH UNIT FOR TIME (PICK A #)"
8130 GOSUB 9010
8140 INPUT TU
8150 PRINT "ENTER VALUE OF VELOCITY IN UNITS OF"
8160 PRINT B$(DU);" PER ";A$(TU);"."
8170 INPUT VE
8180 TM = DI / VE
8190 PRINT
8200 PRINT
8210 PRINT "THE ANSWER IS ";TM;" ";A$(TU);"."
8220 PRINT
```

```
8230 PRINT "WOULD YOU LIKE THE ANSWER TO BE"
8240 PRINT "CONVERTED TO OTHER UNITS?"
8250 PRINT "(YES OR NO)"
8260 INPUT S$
8270 IF S$ = "YES" THEN 8290
8280 GOTO 6120
8290 PRINT
8300 PRINT "WHAT UNITS OF TIME?"
8310 GOSUB 9010
8320 INPUT T2
8330 TX = (TM * A(TU,T2))
8340 PRINT TM;" ";A$(TU)
8350 PRINT "EQUALS ";TX;" ";A$(T2);"."
8360 PRINT
8370 PRINT "PUSH THE 'RETURN' KEY."
8380 INPUT S$
8390 GOTO 6120
9000 REM   PRINT SUBROUTINES
9010 REM   TIME
9020 PRINT
9030 FOR I = 1 TO 5
9040 PRINT "              ";I;". ";A$(I)
9050 NEXT I
9060 PRINT
9070 RETURN
9080 REM   DISTANCE
9090 PRINT
9100 FOR I = 1 TO 6
9110 PRINT "              ";I;". ";B$(I)
9120 NEXT I
9130 PRINT
9140 RETURN
18000 REM   SCROLL
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM   DELAY
19010 FOR K = 1 TO D
19020 NEXT K
19030 RETURN
20000 REM   CLOSING
20010 L = 24
20020 GOSUB 18000
20030 PRINT "WE'RE FINISHED, ";NA$;"!"
20040 PRINT "I HOPE YOU HAD A NICE TIME!"
20050 L = 12
20060 GOSUB 18000
20070 END
21000 DATA    1,.01667,2.778E-4,1.157E-5,3.169E-8
21010 DATA    60,1,.01667,6.944E-4,1.901E-6
21020 DATA    3600,60,1,.04167,1.141E-4
21030 DATA    86400,1440,24,1,2.738E-3
21040 DATA    31557600,525960,8766,365.25,1
21050 DATA    SECONDS,MINUTES,HOURS,DAYS,YEARS
21060 DATA    1,.1,.001,1.0E-6,3.28084E-3,6.2137E-7
21070 DATA    10,1,.01,1.0E-5,3.28084E-2,6.2137E-6
```

```
21080 DATA    1000,100,1,.001,3.28084,6.2137E-4
21090 DATA    1000000,100000,1000,1,3280.84,.62137
21100 DATA     304.8,30.48,.3048,3.048E-4,1,1.894E-4
21110 DATA    1609300,160930,1609.3,1.6093,5280,1
21120 DATA    MILLIMETERS,CENTIMETERS,METERS,KILOMETERS,FEET,M
ILES
```

TABLE OF VARIABLES

```
A$(*) - TIME UNITS
1010 1080 4140 4200 4210 4230
4270 4270 7080 7190 7350 7360
7500 7560 8160 8210 8340 8350
9040

A(*,*) - TIME CONVERSIONS
1010 1040 4250 7340 8330

B$(*) - DISTANCE UNITS
1010 1160 5350 5420 5430 5450
5490 5490 7130 7180 7350 7360
7560 7610 7740 7750 8100 8160
9110

B(*,*) - DISTANCE CONVERSIONS
1010 1120 5470 7340 7730

D - DELAY
2010 2230 19010

D2 - DISTANCE UNIT CONVERTED TO
5400 5430 5470 5490 7330 7340
7360 7720 7730 7750

DI - VALUE OF DU
5460 5470 5490 7140 7150 7340
7580 7610 7730 7740 8110 8180

DU - DISTANCE UNIT STARTED WITH
5320 5330 5350 5420 5450 5470
5490 7120 7130 7180 7340 7350
7540 7560 7610 7730 7740 8090
8100 8160

DX - VALUE OF D2
5470 5490 7730 7750

I - COUNTER
1020 1040 1060 1070 1080 1090
1100 1120 1140 1150 1160 1170
2020 2030 2080 2090 2100 2150
2160 2170 2220 9030 9040 9040
9050 9100 9110 9110 9120 18010
18030

J - COUNTER
```

```
1030 1040 1050 1110 1120 1130
2030 2050 2100 2120 2170 2190


K - COUNTER
19010 19020


L - LINES FOR SCROLLING
2250 2300 2530 5010 5220 6010
6080 6150 7000 7420 8010 18010
20010 20050


NA$ - NAME
2320 2330 20030


S$ - STUDENT ANSWER
2520 5210 6110 7240 7250 7390
7660 7670 7780 8260 8270 8380


SA - STUDENT ANSWER
6280 6290 6300


T2 - TIME UNIT CONVERTED TO
4180 4210 4250 4270 7300 7340
7360 8320 8330 8350


TM - VALUE OF TU
4240 4250 4270 7090 7150 7340
7510 7580 8180 8210 8330 8340


TU - TIME UNIT STARTED WITH
4110 4120 4140 4200 4230 4250
4270 7070 7080 7190 7340 7350
7490 7500 7560 8140 8160 8210
8330 8340


TX - VALUE OF T2
4250 4270 8330 8350


VE - VELOCITY
7150 7180 7350 7570 7580 8170
8180


VX - VELOCITY AFTER CONVERSION
7340 7360


END OF VAR. LIST
```

SAMPLE RUN

```
HI! I'M HAPPY TO SEE YOU.

WHAT IS YOUR NAME?


?JOHN
IT'S NICE TO MEET YOU, JOHN.
```

IN THIS PROGRAM WE ARE GOING TO
STUDY TIME, DISTANCE, AND
VELOCITY.

FIRST, LET'S WORK WITH TIME.
TIME CAN BE MEASURED IN A VARIETY
OF UNITS, INCLUDING SECONDS,
MINUTES, HOURS, AND SO FORTH.

WE WILL PRACTICE CONVERTING
VALUES FROM ONE TO ANOTHER FOR
A BIT JUST TO GET USED TO THEM.

PRESS THE 'RETURN' KEY TO CONTINUE.
?

TYPE IN ONE VALUE AND I WILL CONVERT
IT FOR YOU!

TYPE IN A '0' TO GO ON.

CHANGE FROM (PICK A NUMBER)

        1. SECONDS
        2. MINUTES
        3. HOURS
        4. DAYS
        5. YEARS

?3

CHANGE FROM HOURS TO
(PICK A NUMBER)

        1. SECONDS
        2. MINUTES
        3. HOURS
        4. DAYS
        5. YEARS

?1

CHANGE FROM HOURS TO
SECONDS.

HOW MANY HOURS?
?2

2 HOURS EQUALS 7200 SECONDS.

TYPE IN A 'O' TO GO ON.

CHANGE FROM (PICK A NUMBER)

        1. SECONDS
        2. MINUTES
        3. HOURS
        4. DAYS
        5. YEARS

?0

DISTANCE IS ALSO MEASURED IN
A VARIETY OF UNITS.
AMONG THEM ARE METRIC UNITS
SUCH AS CENTIMETERS, METERS, AND
KILOMETERS. IN ADDITION, THERE
ARE ENGLISH UNITS SUCH AS FEET
AND MILES.

LET'S PRACTICE CONVERTING SOME
DISTANCES BETWEEN THE VARIOUS UNITS.

ALTHOUGH IT ISN'T TOO GOOD OF AN
IDEA TO CONVERT BETWEEN ENGLISH AND
METRIC UNITS, I WILL INCLUDE THEM BOTH
FOR YOU TO WORK WITH.

PUSH 'RETURN' TO CONTINUE.
?

TYPE IN A 'O' TO GO ON.

CHANGE FROM (PICK A NUMBER)

        1. MILLIMETERS
        2. CENTIMETERS
        3. METERS
        4. KILOMETERS
        5. FEET
        6. MILES

?2

CHANGE FROM CENTIMETERS TO
(PICK A NUMBER)

```
        1.  MILLIMETERS
        2.  CENTIMETERS
        3.  METERS
        4.  KILOMETERS
        5.  FEET
        6.  MILES
```

?3

CHANGE FROM CENTIMETERS TO
METERS.

HOW MANY CENTIMETERS?
?350

350 CENTIMETERS EQUALS 3.5 METERS.

TYPE IN A 'O' TO GO ON.

CHANGE FROM (PICK A NUMBER)

```
        1.  MILLIMETERS
        2.  CENTIMETERS
        3.  METERS
        4.  KILOMETERS
        5.  FEET
        6.  MILES
```

?O

NOW LETS WORK WITH VELOCITY.

VELOCITY IS THE DISTANCE COVERED
IN A GIVEN UNIT OF TIME.
(LIKE 60 MILES PER HOUR)

PUSH 'RETURN' TO CONTINUE.
?

PICK A NUMBER.
    1. GIVEN TIME AND DISTANCE,
       FIND VELOCITY.

    2. GIVEN TIME AND VELOCITY,
       FIND DISTANCE.

```
        3. GIVEN VELOCITY AND DISTANCE,
           FIND TIME.
TYPE IN A 'O' TO GO ON.
?1


FINDING VELOCITY GIVEN
TIME AND DISTANCE

WHICH UNIT FOR TIME (PICK A #)

           1. SECONDS
           2. MINUTES
           3. HOURS
           4. DAYS
           5. YEARS

?3
ENTER VALUE OF HOURS.
?3
WHICH UNIT FOR DISTANCE(PICK A #)
           1. MILLIMETERS
           2. CENTIMETERS
           3. METERS
           4. KILOMETERS
           5. FEET
           6. MILES

?6
ENTER VALUE OF MILES.
?250


THE ANSWER IS 83.3333334 MILES
PER HOURS.

WOULD YOU LIKE THE ANSWER TO BE
CONVERTED TO OTHER UNITS?
(YES OR NO)
?YES

WHAT UNITS OF TIME?

           1. SECONDS
           2. MINUTES
           3. HOURS
           4. DAYS
           5. YEARS

?1
WHICH UNITS OF DISTANCE
           1. MILLIMETERS
           2. CENTIMETERS
           3. METERS
           4. KILOMETERS
           5. FEET
           6. MILES
```

```
?3
83.3333334 MILES PER HOURS EQUALS:
37.2523148 METERS PER SECONDS.

PUSH 'RETURN' TO CONTINUE.
?




PICK A NUMBER.
     1. GIVEN TIME AND DISTANCE,
        FIND VELOCITY.

     2. GIVEN TIME AND VELOCITY,
        FIND DISTANCE.

     3. GIVEN VELOCITY AND DISTANCE,
        FIND TIME.
TYPE IN A '0' TO GO ON.
?0


WE'RE FINISHED, JOHN!
I HOPE YOU HAD A NICE TIME!
```
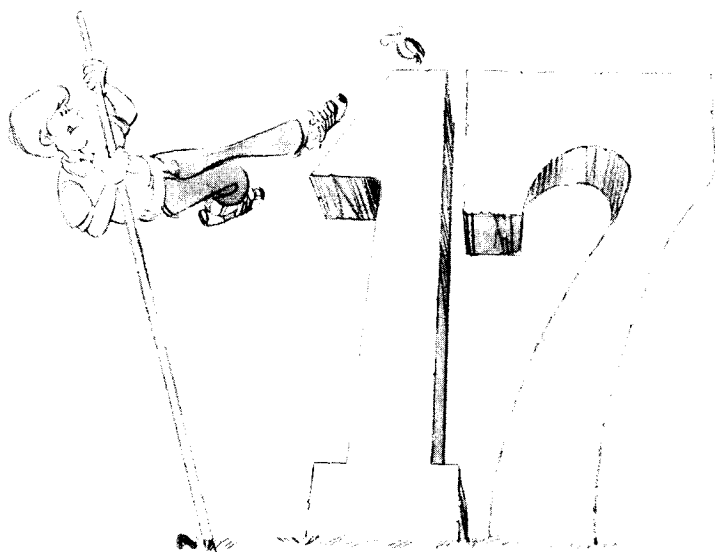
Too High— Too Low

PROGRAM DESCRIPTION

This program exercises the concept of decimals with multiplication and the ability to memorize a range of numbers. The computer thinks of a number and you try to guess it. Each time you guess incorrectly, the computer gives you helpful hints. Be warned, however, that not all the hints are easy, and some of them may require you to use your multiplication skills.

PROGRAM NOTES

1. Changing the "1000" in line 10010 will change the maximum number possible. A smaller number like 100 might be better for younger children.

2. For more advanced students, consider truncating variable "D" at two decimal places, instead of just one. This would involve lines 4100, 11030, and 11060. The result would be something like: "Your answer is about 1.02 times too high."

PROGRAM LISTING: BASIC

```
100 REM TOO HIGH-TOO LOW BY GARY ORWIG
1000 REM INITIALIZATION
1010 DIM NA$(40)
1020 DIM RS$(20)
1030 REM USE FULL SCREEN
1040 POKE 82,0
1050 PRINT
```

```
2000 REM INTRODUCTION
2010 FOR I=1 TO 24
2020 PRINT
2030 NEXT I
2040 PRINT "HELLO!  I'M HAPPY TO SEE YOU!"
2050 PRINT "WHAT IS YOUR NAME";
2060 INPUT NA$
2070 PRINT "I HOPE YOU HAVE A NICE TIME,"
2080 PRINT NA$;"."
2090 PRINT
2100 PRINT
2110 PRINT "THIS GAME IS VERY EASY TO EXPLAIN."
2120 PRINT "I WILL THINK OF A NUMBER,AND"
2130 PRINT "IT WILL BE YOUR JOB TO GUESS IT."
2140 PRINT
2150 PRINT
2160 FOR DE=1 TO 1000
2170 NEXT DE
2180 PRINT "HERE WE GO!"
2190 PRINT
2200 PRINT
2210 PRINT
4000 REM MAIN PROGRAM
4010 GOSUB 10000
4020 PRINT "I AM THINKING OF A NUMBER."
4030 PRINT "TYPE IN YOUR GUESS!"
4040 INPUT SA
4050 N=N+1
4060 IF SA<>0 THEN 4090
4070 PRINT "NO, I'M NOT THINKING OF 0, TRY AGAIN!"
4080 GOTO 4040
4090 GOSUB 11000
4100 IF D=1 THEN 4140
4110 PRINT "YOUR GUESS IS ABOUT ";D
4120 PRINT "TIMES TOO ";RS$;"!"
4130 GOTO 4170
4140 PRINT "YOU ARE CLOSE, ";NA$;"!"
4150 PRINT "BUT YOUR GUESS IS"
4160 PRINT "A BIT TOO ";RS$;"."
4170 PRINT "GUESS AGAIN."
4180 PRINT
4190 PRINT
4200 PRINT
4210 GOTO 4030
10000 REM RANDOMIZING
10010 C=INT(RND(0)*1000)+1
10020 RETURN
11000 REM JUDGE ANSWER
11010 IF SA=C THEN 12000
11020 IF SA<C THEN 11060
11030 D=INT(SA*10/C)/10
11040 RS$="HIGH"
11050 RETURN
11060 D=INT(C*10/SA)/10
11070 RS$="LOW"
11080 RETURN
12000 REM REWARD
```

```
12010 FOR I=1 TO 11
12020 PRINT
12030 NEXT I
12040 PRINT "YOU FOUND MY NUMBER"
12050 PRINT "IN ";N;" TRIES, ";NA$;"!"
12060 FOR I=1 TO 11
12070 PRINT
12080 NEXT I
12090 END
```

TABLE OF VARIABLES

NA$

1010	2060	2080	4140	12050

RS$

1020	4120	4160	11040	11070

I

2010	2030	12010	12030	12060	12080

DE

2160	2170

SA

4040	4060	11010	11020	11030	11060

N

4050	4050	12050

D

4100	4110	11030	11060

C

10010	11010	11020	11030	11060

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM  TOO HIGH-TOO LOW BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM INITIALIZE
1010 REM USE FULL SCREEN
1020 POKE 82,0
2000 REM  INTRODUCTION
2010 FOR I = 1 TO 24
2020 PRINT
2030 NEXT I
2040 PRINT "HELLO!  I'M HAPPY TO SEE YOU!"
2050 PRINT "WHAT IS YOUR NAME";
2060 INPUT NA$
2070 PRINT "I HOPE YOU HAVE A NICE TIME,"
2080 PRINT NA$;"."
```

```
2090 PRINT
2100 PRINT
2110 PRINT "THIS GAME IS VERY EASY TO EXPLAIN."
2120 PRINT "I WILL THINK OF A NUMBER,AND"
2130 PRINT "IT WILL BE YOUR JOB TO GUESS IT."
2140 PRINT
2150 PRINT
2160 FOR DE = 1 TO 5000
2170 NEXT DE
2180 PRINT "HERE WE GO!"
2190 PRINT
2200 PRINT
2210 PRINT
4000 REM   MAIN PROGRAM
4010 GOSUB 10000
4020 PRINT "I AM THINKING OF A NUMBER."
4030 PRINT "TYPE IN YOUR GUESS!"
4040 INPUT SA
4050 N = N + 1
4060 IF SA < > 0 THEN 4090
4070 PRINT "NO, I'M NOT THINKING OF 0, TRY AGAIN!"
4080 GOTO 4040
4090 GOSUB 11000
4100 IF D = 1.0 THEN 4140
4110 PRINT "YOUR GUESS IS ABOUT ";D
4120 PRINT "TIMES TOO ";RS$;"!"
4130 GOTO 4170
4140 PRINT "YOU ARE CLOSE, ";NA$;"!"
4150 PRINT "BUT YOUR GUESS IS"
4160 PRINT "A BIT TOO ";RS$;"."
4170 PRINT "GUESS AGAIN."
4180 PRINT
4190 PRINT
4200 PRINT
4210 GOTO 4030
10000 REM    RANDOMIZING
10010 C =   RND(1000)
10020 RETURN
11000 REM   JUDGE ANSWER
11010 IF SA = C THEN 12000
11020 IF SA < C THEN 11060
11030 D =   INT (SA * 10 / C) / 10
11040 RS$ = "HIGH"
11050 RETURN
11060 D =   INT (C * 10 / SA) / 10
11070 RS$ = "LOW"
11080 RETURN
12000 REM  REWARD
12010 FOR I = 1 TO 11
12020 PRINT
12030 NEXT I
12040 PRINT "YOU FOUND MY NUMBER"
12050 PRINT "IN ";N;" TRIES, ";NA$;"!"
12060 FOR I = 1 TO 11
12070 PRINT
12080 NEXT I
12090 END
```

TABLE OF VARIABLES

C - CORRECT ANSWER
10010 11010 11020 11030 11060

D - PROPORTION
4100 4110 11030 11060

DE - DELAY
2160 2170

I - COUNTER
2010 2030 12010 12030 12060
12080

N - NUMBER OF TRIES
4050 4050 12050

NA$ - NAME
2060 2080 4140 12050

RS$ - HIGH OR LOW
4120 4160 11040 11070

SA - STUDENT ANSWER
4040 4060 11010 11020 11030
11060

END OF VAR. LIST

SAMPLE RUN

HELLO! I'M HAPPY TO SEE YOU!
WHAT IS YOUR NAME?KIM
I HOPE YOU HAVE A NICE TIME,
KIM.

THIS GAME IS VERY EASY TO EXPLAIN.
I WILL THINK OF A NUMBER,AND
IT WILL BE YOUR JOB TO GUESS IT.

HERE WE GO!

I AM THINKING OF A NUMBER.
TYPE IN YOUR GUESS!
?500
YOUR GUESS IS ABOUT 21.7
TIMES TOO HIGH!
GUESS AGAIN.

```
TYPE IN YOUR GUESS!
?24
YOU ARE CLOSE, KIM!
BUT YOUR GUESS IS
A BIT TOO HIGH.
GUESS AGAIN.


TYPE IN YOUR GUESS!
?20
YOUR GUESS IS ABOUT 1.1
TIMES TOO LOW!
GUESS AGAIN.


TYPE IN YOUR GUESS!
?22
YOU ARE CLOSE, KIM!
BUT YOUR GUESS IS
A BIT TOO LOW.
GUESS AGAIN.


TYPE IN YOUR GUESS!
?23
```

```
YOU FOUND MY NUMBER
IN 5 TRIES, KIM!
```
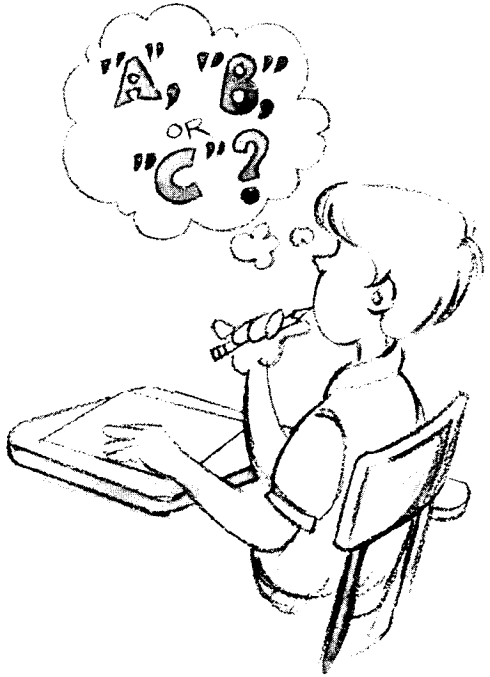
Trivia Quiz

PROGRAM DESCRIPTION

Any multiple-choice quiz can be generated from this program by inputting multiple-choice questions from an instructor-made data file. The computer presents a question with multiple-choice answers, judges the answers, and provides a score at the end of the program. This is an excellent tool for testing on a variety of subjects.

PROGRAM NOTES

1. Notice that subroutine 10000 does not randomize but instead presents the problems in order (sequentially). You can change that if you want. Just look at line 10000 in programs that do randomize.

2. Problems that have answers less than the number 5 can get confusing. It might be better to switch to: "Type in an A, B, C, or D" if you have many of these.

PROGRAM LISTING: BASIC

```
100 REM TRIVIA QUIZ BY GARY ORWIG
1000 REM INITIALIZATION - SET 'TL' EQUAL TO THE NUMBER OF PR
OBLEMS IN YOUR DATA SET.
1010 TL=20
1020 DIM Q$(150),A1$(40),A2$(40),A3$(40),A4$(40),CR(TL)
1030 DIM NA$(40),S$(20)
1040 FOR I=1 TO TL
```

```
1050 CR(I)=0
1060 NEXT I
1070 REM USE FULL SCREEN
1080 POKE 82,0
1090 PRINT
2000 REM INTRODUCTION
2010 FOR I=1 TO 50
2020 PRINT "        TRIVIA QUIZ          ";
2030 NEXT I
2040 D=200
2050 GOSUB 19000
2060 L=12
2070 GOSUB 18000
2080 PRINT "WHAT IS YOUR NAME?"
2090 GOSUB 18000
2100 INPUT NA$
2110 PRINT
2120 PRINT
2130 PRINT "I'M HAPPY TO MEET YOU, ";NA$;"."
2140 PRINT
2150 PRINT
2160 PRINT "THIS IS A QUIZ WHICH COVERS A WIDE"
2170 PRINT "VARIETY OF TOPICS.  I WILL ASK YOU"
2180 PRINT "QUESTIONS, AND YOU PICK THE NUMBER"
2190 PRINT "OF THE RIGHT ANSWER."
2200 L=8
2210 GOSUB 18000
2220 PRINT "READY?  PUSH THE 'RETURN'"
2230 PRINT "KEY TO BEGIN."
2240 INPUT S$
4000 REM MAIN PROGRAM
4010 GOSUB 10000
4020 READ Q$,A1$,A2$,A3$,A4$,KE
4030 IF CR(NX)=5 THEN 4070
4040 C=0
4050 GOSUB 17000
4060 GOTO 4100
4070 C=C+1
4080 IF C=TL+1 THEN 20000
4090 GOTO 4010
4100 PRINT "TYPE IN A 1, 2, 3, OR 4";
4110 INPUT SA
4120 IF SA<1 OR SA>4 THEN 4100
4130 GOSUB 15000
4140 GOSUB 11000
4150 IF HT=1 THEN 4210
4160 GOSUB 14000
4170 PRINT "WE WILL TRY THAT ONE AGAIN LATER!"
4180 D=200
4190 GOSUB 19000
4200 GOTO 4010
4210 GOSUB 12000
4220 D=200
4230 GOSUB 19000
4240 GOTO 4010
10000 REM SEQUENCE QUESTIONS
10010 NX=NX+1
```

```
10020 IF NX<TL+1 THEN 10060
10030 NX=0
10040 RESTORE
10050 GOTO 10010
10060 RETURN
11000 REM JUDGE ANSWER
11010 IF SA=KE THEN 11040
11020 HT=0
11030 RETURN
11040 HT=1
11050 CR(NX)=5
11060 RETURN
12000 REM REWARD
12010 PRINT
12020 PRINT "GREAT!"
12030 PRINT
12040 RETURN
14000 REM WRONG
14010 PRINT
14020 PRINT "SORRY!"
14030 PRINT
14040 RETURN
15000 REM SCORE KEEPING
15010 N=N+1
15020 RETURN
17000 REM PRINT OUT PROBLEM
17010 L=12
17020 GOSUB 18000
17030 PRINT Q$
17040 PRINT
17050 PRINT "     1. ";A1$
17060 PRINT "     2. ";A2$
17070 PRINT "     3. ";A3$
17080 PRINT "     4. ";A4$
17090 L=8
17100 GOSUB 18000
17110 RETURN
18000 REM PRINT LINES
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM DELAY
19010 FOR I=1 TO D
19020 NEXT I
19030 RETURN
20000 REM CLOSING
20010 L=12
20020 GOSUB 18000
20030 PRINT "IT TOOK ";N;" TRIES TO GET"
20040 PRINT TL;" PROBLEMS CORRECT!"
20050 END
21000 REM DATA
21010 DATA HOW MANY CALORIES IN ONE TEASPOON OF     GRANULATE
D SUGAR?
21020 DATA 15,25,40,50,2
21030 DATA HOW MANY BONES ARE IN THE HUMAN BODY?
```

```
21040 DATA 150,192,206,218,3
21050 DATA HOW MUCH DID IT COST TO SEND A POST        CARD IN 1
980?
21060 DATA 6 CENTS,8 CENTS, 10 CENTS,12 CENTS,3
21070 DATA HOW MANY OCEANS ARE THERE?
21080 DATA 4,5,6,7,4
21090 DATA WHAT STATE WAS THE LAST TO JOIN THE        UNITED ST
ATES?
21100 DATA HAWAII,ALASKA,ARIZONA,UTAH,1
21110 DATA AT WHAT TEMPERATURE DOES WATER BOIL?
21120 DATA 50 DEGREES C.,75 DEGREES C.,100 DGREES C.,125 DEG
REES C.,3
21130 DATA WHAT IS THE CLOSEST PLANET TO THE SUN?
21140 DATA EARTH,MERCURY,VENUS,MARS,2
21150 DATA WHAT IS YOUR ZODIAC SIGN IF YOUR BIRTHDAY IS SEPT
EMBER 16?
21160 DATA CANCER,PISCES,ARIES,VIRGO,4
21170 DATA HOW MANY SIDES DOES A HEXAGON HAVE?
21180 DATA 4,5,6,8,3
21190 DATA HOW MANY LINES MAKE A MUSICAL STAFF?
21200 DATA 4,5,6,7,2
21210 DATA WHAT IS THE NATIONAL ANTHEM OF THE         UNITED ST
ATES?
21220 DATA AMERICA,AMERICA THE BEAUTIFUL,STARS AND STRIPES F
OREVER,STAR SPANGLED BANNER,4
21230 DATA WHAT IS THE REAL NAME OF THE FONZ?
21240 DATA JAMES STEWART,HENRY WINKLER,DUSTIN HOFFMAN,JOHN D
AVIDSON,2
21250 DATA HOW MANY DAYS DOES IT TAKE FOR MARS TO  GO AROUND
 THE SUN?
21260 DATA 365,489.2,521.5,686.9,4
21270 DATA WHAT IS THE CAPITAL OF ILLINOIS?
21280 DATA SPRINGFIELD,INDIANAPOLIS,AUSTIN,MADISON,1
21290 DATA WHAT IS THE LARGEST RIVER IN THE WORLD?
21300 DATA MISSISSIPPI,NILE,AMAZON,RHINE,3
21310 DATA WHAT IS THE HIGHEST MOUNTAIN IN THE WORLD?
21320 DATA MOUNT MCKINLEY,MT ST. HELENS,MOUNT DORA,MOUNT EVE
REST,4
21330 DATA WHEN IT IS 5:00 A.M. IN FLORIDA WHAT TIME IS IT I
N CALIFORNIA?
21340 DATA 2:00 A.M.","4:00 A.M.","6:00 A.M.","8:00 A.M.",1
21350 DATA WHAT IS THE CAPITAL OF SPAIN?
21360 DATA PARIS,MADRID,LISBON,BERLIN,2
21370 DATA WHAT IS THE SQUARE ROOT OF 256?
21380 DATA 14,15,16,18,3
21390 DATA IN WHICH FOOD WOULD THE MOST PROTEIN BE FOUND?
21400 DATA APPLE,CHICKEN,BREAD,LETTUCE,2
```

TABLE OF VARIABLES

TL
   1010   1020   1040   4080   10020 20040

Q$
   1020   4020   17030

A1$
  1020   4020   17050

A2$
  1020   4020   17060

A3$
  1020   4020   17070

A4$
  1020   4020   17080

CR(
  1020   1050   4030   11050

NA$
  1030   2100   2130

S$
  1030   2240

I
  1040   1050   1060   2010   2030   18010
  18030 19010 19020

D
  2040   4180   4220   19010

L
  2060   2200   17010 17090 18010 20010

KE
  4020   11010

NX
  4030 10010 10010 10020 10030 11050

C
  4040   4070   4070   4080

SA
  4110   4120   4120   11010

HT
  4150 11020 11040

N
  15010 15010 20030

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   TRIVIA QUIZ BY GARY ORWIG
1000 REM    INITIALIZATION - SET 'TL' EQUAL TO THE NUMBER OF
PROBLEMS IN YOUR DATA SET.
```

```
1010 TL = 20
1020 DIM Q$(TL),A1$(TL),A2$(TL),A3$(TL),A4$(TL),KE(TL)
1030 FOR I = 1 TO TL
1040 READ Q$(I),A1$(I),A2$(I),A3$(I),A4$(I),KE(I)
1050 NEXT I
1060 REM USE FULL SCREEN
1070 POKE 82,0
1080 CLS
2000 REM   INTRODUCTION
2010 FOR I = 1 TO 10
2020 FOR J = 1 TO 50
2030 NEXT J
2040 PRINT "        TRIVIA QUIZ          ";
2050 NEXT I
2060 D = 2500
2070 GOSUB 19000
2080 L = 12
2090 GOSUB 18000
2100 PRINT "WHAT IS YOUR NAME?"
2110 GOSUB 18000
2120 INPUT NA$
2130 PRINT
2140 PRINT
2150 PRINT "I'M HAPPY TO MEET YOU, ";NA$;"."
2160 PRINT
2170 PRINT
2180 PRINT "THIS IS A QUIZ WHICH COVERS A WIDE"
2190 PRINT "VARIETY OF TOPICS.  I WILL ASK YOU"
2200 PRINT "QUESTIONS, AND YOU PICK THE NUMBER OF"
2210 PRINT "OF THE RIGHT ANSWER.
2220 L = 8
2230 GOSUB 18000
2240 PRINT "READY?  PUSH THE 'RETURN'"
2250 PRINT "KEY TO BEGIN."
2260 INPUT S$
4000 REM   MAIN PROGRAM
4010 GOSUB 10000
4020 IF KE(NX) = 5 THEN 4060
4030 C = 0
4040 GOSUB 17000
4050 GOTO 4090
4060 C = C + 1
4070 IF C = TL + 1 THEN 20000
4080 GOTO 4010
4090 PRINT "TYPE IN A 1, 2, 3, OR 4";
4100 INPUT SA
4110 IF SA < 1 OR SA > 4 THEN 4090
4120 GOSUB 15000
4130 GOSUB 11000
4140 IF HT = 1 THEN 4200
4150 GOSUB 14000
4160 PRINT "WE WILL TRY THAT ONE AGAIN LATER!"
4170 D = 2000
4180 GOSUB 19000
4190 GOTO 4010
4200 GOSUB 12000
4210 D = 2000
```

```
4220 GOSUB 19000
4230 GOTO 4010
10000 REM  SEQUENCE QUESTIONS
10010 NX = NX + 1
10020 IF NX < TL + 1 THEN 10050
10030 NX = 0
10040 GOTO 10010
10050 RETURN
11000 REM  JUDGE ANSWER
11010 IF SA = KE(NX) THEN 11040
11020 HT = 0
11030 RETURN
11040 HT = 1
11050 KE(NX) = 5
11060 RETURN
12000 REM  REWARD
12010 PRINT
12020 PRINT "GREAT!"
12030 PRINT
12040 RETURN
14000 REM  WRONG
14010 PRINT
14020 PRINT "SORRY!"
14030 PRINT
14040 RETURN
15000 REM  SCORE KEEPING
15010 N = N + 1
15020 RETURN
17000 REM  PRINT OUT PROBLEM
17010 L = 12
17020 GOSUB 18000
17030 PRINT Q$(NX)
17040 PRINT
17050 PRINT "     1. ";A1$(NX)
17060 PRINT "     2. ";A2$(NX)
17070 PRINT "     3. ";A3$(NX)
17080 PRINT "     4. ";A4$(NX)
17090 L = 8
17100 GOSUB 18000
17110 RETURN
18000 REM  PRINT LINES
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM  DELAY
19010 FOR I = 1 TO D
19020 NEXT I
19030 RETURN
20000 REM  CLOSING
20010 L = 12
20020 GOSUB 18000
20030 PRINT "IT TOOK ";N;" TRIES TO GET"
20040 PRINT TL;" PROBLEMS CORRECT!"
20050 END
21000 REM  DATA
21010 DATA "HOW MANY CALORIES IN ONE TEASPOON OF     GRANULAT
```

ED SUGAR?"
21020 DATA 15,25,40,50,2
21030 DATA "HOW MANY BONES ARE IN THE HUMAN BODY?"
21040 DATA 150,192,206,218,3
21050 DATA "HOW MUCH DID IT COST TO SEND A POST   CARD IN
 1980?"
21060 DATA 6 CENTS,8 CENTS, 10 CENTS,12 CENTS,3
21070 DATA "HOW MANY OCEANS ARE THERE?"
21080 DATA 4,5,6,7,4
21090 DATA "WHAT STATE WAS THE LAST TO JOIN THE   UNITED S
TATES?"
21100 DATA HAWAII,ALASKA,ARIZONA,UTAH,1
21110 DATA "AT WHAT TEMPERATURE DOES WATER BOIL?"
21120 DATA 50 DEGREES C.,75 DEGREES C.,100 DGREES C.,125 DE
GREES C.,3
21130 DATA "WHAT IS THE CLOSEST PLANET TO THE SUN?"
21140 DATA EARTH,MERCURY,VENUS,MARS,2
21150 DATA "IF YOUR BIRTHDAY IS SEPTEMBER 16, WHAT IS YOUR
ZODIAC SIGN?"
21160 DATA CANCER,PISCES,ARIES,VIRGO,4
21170 DATA "HOW MANY SIDES DOES A HEXAGON HAVE?"
21180 DATA 4,5,6,8,3
21190 DATA "HOW MANY LINES MAKE A MUSICAL STAFF?"
21200 DATA 4,5,6,7,2
21210 DATA "WHAT IS THE NATIONAL ANTHEM OF THE   UNITED S
TATES?"
21220 DATA AMERICA,AMERICA THE BEAUTIFUL,STARS AND STRIPES
FOREVER,STAR SPANGLED BANNER,4
21230 DATA "WHAT IS THE REAL NAME OF THE FONZ?"
21240 DATA JAMES STEWART,HENRY WINKLER,DUSTIN HOFFMAN,JOHN D
AVIDSON,2
21250 DATA "HOW MANY DAYS DOES IT TAKE FOR MARS TO GO AROU
ND THE SUN?"
21260 DATA 365,489.2,521.5,686.9,4
21270 DATA "WHAT IS THE CAPITAL OF ILLINOIS?
21280 DATA SPRINGFIELD,INDIANAPOLIS,AUSTIN,MADISON,1
21290 DATA "WHAT IS THE LARGEST RIVER IN THE WORLD?"
21300 DATA MISSISSIPPI,NILE,AMAZON,RHINE,3
21310 DATA "WHAT IS THE HIGHEST MOUNTAIN IN THE WORLD?"
21320 DATA MOUNT MCKINLEY,MT ST. HELENS,MOUNT DORA,MOUNT EVE
REST,4
21330 DATA "WHEN IT IS 5:00 A.M. IN FLORIDA WHAT TIME IS IT
IN CALIFORNIA?"
21340 DATA "2:00 A.M.","4:00 A.M.","6:00 A.M.","8:00 A.M.",1
21350 DATA "WHAT IS THE CAPITAL OF SPAIN?"
21360 DATA PARIS,MADRID,LISBON,BERLIN,2
21370 DATA "WHAT IS THE SQUARE ROOT OF 256?"
21380 DATA 14,15,16,18,3
21390 DATA "IN WHICH FOOD WOULD THE MOST PROTEIN BE FOUND?"
21400 DATA APPLE,CHICKEN,BREAD,LETTUCE,2

TABLE OF VARIABLES

A1$(*) — ANSWER 1
 1020 1040 17050

A2$(*) - ANSWER 2
1020 1040 17060

A3$(*) - ANSWER 3
1020 1040 17070

A4$(*) - ANSWER 4
1020 1040 17080

C - NUMBER OF PROBLEMS ANSWERED
4030 4060 4060 4070

D - DELAY
2060 4170 4210 19010

HT - HIT
4140 11020 11040

I - COUNTER
1030 1040 1040 1040 1040 1040
1040 1050 2010 2050 18010 18030
19010 19020

J - COUNTER
2020 2030

KE(*) - KEYS
1020 1040 4020 11010 11050

L - LINES OF SCROLLING
2080 2220 17010 17090 18010
20010

N - NUMBER OF TRIES
15010 15010 20030

NA$ - NAME
2120 2150

NX - NUMBER IN SEQUENCE
4020 10010 10010 10020 10030
11010 11050 17030 17050 17060
17070 17080

Q$(*) - QUESTIONS
1020 1040 17030

S$ - STUDENT ANSWER
2260

SA - STUDENT ANSWER
4100 4110 4110 11010

TL - NUMBER OF QUESTIONS IN LIST
1010 1020 1020 1020 1020 1020
1020 1030 4070 10020 20040

170   END OF VAR. LIST

SAMPLE RUN

WHAT IS YOUR NAME?

?JOHNNY

I'M HAPPY TO MEET YOU, JOHNNY.

THIS IS A QUIZ WHICH COVERS A WIDE
VARIETY OF TOPICS. I WILL ASK YOU
QUESTIONS, AND YOU PICK THE NUMBER OF
OF THE RIGHT ANSWER.

READY? PUSH THE 'RETURN
KEY TO BEGIN.
?

HOW MANY CALORIES IN ONE TEASPOON OF   GRANULATED SUGAR?

        1. 15
        2. 25
        3. 40
        4. 50

TYPE IN A 1, 2, 3, OR 4?2

GREAT!

HOW MANY BONES ARE IN THE HUMAN BODY?

        1. 150
        2. 192
        3. 206
        4. 218

TYPE IN A 1, 2, 3, OR 4?3

GREAT!

HOW MUCH DID IT COST TO SEND A POST   CARD IN 1980?

        1. 6 CENTS
        2. 8 CENTS
        3. 10 CENTS
        4. 12 CENTS

TYPE IN A 1, 2, 3, OR 4?1

SORRY!

WE WILL TRY THAT ONE AGAIN LATER!

BRANCHING PROGRAMS

Branching programs allow individual learners to take different routes through the instruction, depending on how much they know and how fast they learn. The microcomputer is an ideal vehicle for these programs because it allows instant access to any part of any program. The following selection of program listings and sample runs was chosen to demonstrate the methodology by which branching programming is used to instruct the learner in such subject areas as mathematics, metric conversion, and sentence grammar.

Factor Game
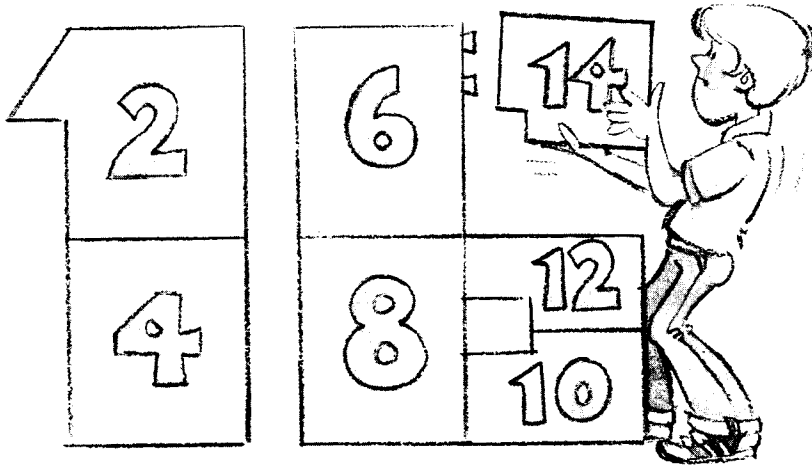
PROGRAM DESCRIPTION

This is an interesting instructional game on factoring numbers. The computer gives you an initial quiz (pre-test) to find out if you know what factors of numbers are all about. If you obtain all of the answers correctly, you don't need to receive instruction on factors. On the other hand, for those of you who may have wrong answers, the computer will give you a lesson on factors before you can play the game.

In the factor game you compete against the computer. To start the game, the computer displays a set of numbers. You then select a number and add the amount of the number to your score. The computer will select all of the factors of the number you chose except the number itself. It then adds the amounts of the numbers selected to its score. The game is played until the original list of numbers selected by the computer is completed. The object of the game is to try to select numbers that do not have many factors left in the list. Otherwise, the computer will gobble up all of the numbers in the list and beat you soundly!

PROGRAM NOTES

When a large maximum number is chosen, the list of numbers will wrap around two or more lines on the screen. See if you can come up with a subroutine that will prevent splitting a number between the end of one line and the beginning of the next. This seems to be a problem mainly with the ATARI BASIC.

PROGRAM LISTING: BASIC

```
100 REM FACTOR GAME BY GARY ORWIG
1000 REM INITIALIZATION
1010 DIM NA$(40)
1020 DIM SA$(5)
1030 REM USE FULL SCREEN
1040 POKE 82,0
1050 PRINT
2000 REM INTRODUCTION
2010 L=12
2020 GOSUB 18000
2030 PRINT "                    FACTORS"
2040 GOSUB 18000
2050 D=200
2060 GOSUB 19000
2070 GOSUB 18000
2080 PRINT "WHAT IS YOUR NAME?"
2090 GOSUB 18000
2100 INPUT NA$
2110 GOSUB 18000
2120 PRINT "I'M HAPPY TO MEET YOU, ";NA$;"."
2130 GOSUB 18000
2140 GOSUB 19000
2150 GOSUB 18000
2160 PRINT "THIS IS A GAME OF FACTORS.  BEFORE WE"
2170 PRINT "GO VERY FAR, I'D BETTER CHECK TO MAKE"
2180 PRINT "SURE YOU KNOW JUST WHAT FACTORS ARE!"
2190 PRINT
2200 PRINT "WHAT NUMBER IS NOT A FACTOR OF 12?"
2210 PRINT
2220 PRINT "          1"
2230 PRINT "          3"
2240 PRINT "          4"
2250 PRINT "          6"
2260 PRINT "          8"
2270 PRINT "          12"
2280 L=4
2290 GOSUB 18000
2300 INPUT SA
2310 IF SA=8 THEN 2730
2320 GOSUB 18000
2330 PRINT " 1, 3, 4, 6, 8, 12"
2340 PRINT
2350 PRINT "THE NUMBER '8' IS THE ONLY NUMBER LISTED"
2360 PRINT "WHICH IS NOT A FACTOR OF 12!"
2370 PRINT
2380 PRINT "IT IS THE ONLY NUMBER IN THE SET WHICH"
2390 PRINT "HAS A REMAINDER WHEN DIVIDED INTO"
2400 PRINT "THE NUMBER '12.'  ALL OF THE OTHER"
2410 PRINT "NUMBERS IN THE SET DIVIDE INTO 12"
2420 PRINT "EVENLY."
2430 PRINT
2440 PRINT "ONE NUMBER IS A FACTOR OF ANOTHER"
2450 PRINT "NUMBER IF IT DIVIDES INTO THE NUMBER"
2460 PRINT "EVENLY."
```

```
2470 PRINT
2480 GOSUB 17000
2490 L=12
2500 GOSUB 18000
2510 PRINT "LET'S TRY ONE MORE."
2520 PRINT
2530 PRINT "WHICH OF THE FOLLOWING IS NOT A FACTOR"
2540 PRINT "OF THE NUMBER 10?"
2550 PRINT
2560 PRINT "          1"
2570 PRINT "          2"
2580 PRINT "          3"
2590 PRINT "          5"
2600 PRINT "         10"
2610 L=6
2620 GOSUB 18000
2630 INPUT SA
2640 IF SA=3 THEN 2730
2650 PRINT "THE NUMBER '3' IS THE ONLY NUMBER WHICH"
2660 PRINT "DOES NOT DIVIDE INTO 10 EVENLY!"
2670 PRINT "I THINK WE BETTER BACK UP A BIT, ";NA$
2680 PRINT
2690 GOSUB 17000
2700 L=12
2710 GOSUB 18000
2720 GOTO 2200
2730 L=12
2740 GOSUB 18000
2750 PRINT "VERY GOOD, ";NA$;"!  I THINK YOU ARE"
2760 PRINT "READY FOR THE GAME!"
2770 GOSUB 18000
2780 D=200
2790 GOSUB 19000
2800 GOSUB 18000
3000 REM INSTRUCTIONS
3010 L=12
3020 GOSUB 18000
3030 PRINT "THIS GAME IS DIFFICULT TO EXPLAIN,"
3040 PRINT "BUT YOU WILL CATCH ON QUICKLY!"
3050 PRINT
3060 PRINT "I WILL GIVE YOU A SET OF NUMBERS,"
3070 PRINT "LIKE THIS:"
3080 PRINT
3090 PRINT "1  2  3  4  5  6  7  8  9  10"
3100 PRINT
3110 PRINT "WHEN YOU PICK A NUMBER,"
3120 PRINT "LIKE '10,' YOU"
3130 PRINT "GET TO ADD IT TO YOUR SCORE."
3140 L=5
3150 GOSUB 18000
3160 GOSUB 17000
3170 L=12
3180 GOSUB 18000
3190 PRINT "BUT..........."
3200 PRINT
3210 PRINT "I GET TO ADD ITS REMAINING FACTORS"
3220 PRINT "(5, 2, AND 1) TO MY SCORE!"
3230 PRINT
```

```
3240 PRINT "NOW THE LIST WILL BE MISSING ALL THOSE"
3250 PRINT "NUMBERS!"
3260 PRINT
3270 PRINT "*  *  3  4  *  6  7  8  9  *"
3280 PRINT
3290 PRINT "AND WE START AGAIN!"
3300 PRINT
3310 PRINT "IF YOU PICK A NUMBER WHICH HAS NO "
3320 PRINT "FACTORS LEFT IN THE LIST, I GET IT!"
3330 PRINT "ALSO, I GET ALL THE NUMBERS LEFT OVER"
3340 PRINT "WHEN ALL THE FACTORS ARE GONE!"
3350 PRINT
3360 PRINT
3370 PRINT "READY?"
3380 GOSUB 17000
3390 REM INITIALIZATION
3400 PRINT
3410 PRINT "WHAT IS THE LARGEST NUMBER YOU WANT?"
3420 INPUT MX
3430 DIM FA(MX)
3440 PRINT
3450 PRINT "THE HIGHEST NUMBER WILL BE ";MX;"."
3460 FOR I=1 TO MX
3470 FA(I)=I
3480 NEXT I
4000 REM START OF MAIN PROGRAM
4010 PRINT
4020 PRINT "HERE IS THE LIST OF NUMBERS:"
4030 PRINT
4040 FOR I=1 TO MX
4050 IF FA(I)=0 THEN 4090
4060 PRINT FA(I);"   ";
4070 NEXT I
4080 GOTO 4110
4090 PRINT "*   ";
4100 NEXT I
4110 PRINT
5000 REM INPUT NUMBER
5010 PRINT
5020 PRINT "PICK A NUMBER."
5030 INPUT N
5040 IF N>MX THEN 5070
5050 IF N<1 THEN 5070
5060 IF FA(N)=N THEN 6000
5070 PRINT
5080 PRINT "THAT NUMBER ISN'T IN THE LIST!"
5090 PRINT "TRY AGAIN!"
5100 GOTO 5030
6000 REM FIND FACTORS
6010 J=0
6020 FOR I=2 TO N
6030 F=N/I
6040 IF F<>INT(F) THEN 6110
6050 IF FA(F)=0 THEN 6110
6060 PRINT
6070 PRINT "I GET ";F;"!"
6080 CT=CT+F
6090 FA(F)=0
```

```
6100 GOTO 6120
6110 J=J+1
6120 NEXT I
6130 IF J=N-1 THEN 6170
6140 SS=SS+N
6150 FA(N)=0
6160 GOTO 7000
6170 J=0
6180 CT=CT+N
6190 FA(N)=0
6200 PRINT
6210 PRINT "I GET ";N;"!  IT HAD NO FACTORS!"
6220 PRINT
7000 REM CHECK REM. #'S FOR FACTORS
7010 FOR I=1 TO MX
7020 J=MX-I+1
7030 FOR K=2 TO J
7040 F=J/K
7050 IF F<>INT(F) THEN 7130
7060 IF FA(F)=0 THEN 7130
7070 PRINT
7080 PRINT "YOUR SCORE IS: ";SS
7090 PRINT
7100 PRINT "MY SCORE IS: ";CT
7110 PRINT
7120 GOTO 4000
7130 NEXT K
7140 NEXT I
7150 PRINT
8000 REM NO FACTORS LEFT
8010 FOR I=1 TO MX
8020 IF FA(I)=0 THEN 8070
8030 PRINT
8040 PRINT "I GET ";FA(I);"!"
8050 CT=CT+FA(I)
8060 FA(I)=0
8070 NEXT I
8080 PRINT
8090 PRINT
8100 PRINT "YOUR FINAL TOTAL IS: ";SS
8110 PRINT
8120 PRINT "MY FINAL TOTAL IS: ";CT
8130 PRINT
8140 IF CT>SS THEN PRINT "I WIN, ";NA$;"!"
8150 IF SS>CT THEN PRINT "YOU WIN, ";NA$;"!"
8160 IF SS=CT THEN PRINT "IT'S A TIE, ";NA$;"!"
8170 END
17000 REM PAUSE
17010 PRINT "PUSH 'RETURN' TO CONTINUE."
17020 INPUT SA$
17030 RETURN
18000 REM SCROLLING
18010 FOR S=1 TO L
18020 PRINT
18030 NEXT S
18040 RETURN
19000 REM DELAY
```

```
19010 FOR S=1 TO D
19020 NEXT S
19030 RETURN
```

TABLE OF VARIABLES

NA$
    1010   2100   2120   2670   2750   8140
    8150   8160

SA$
    1020   17020

L
    2010   2280   2490   2610   2700   2730
    3010   3140   3170   18010

D
    2050   2780   19010

SA
    2300   2310   2630   2640

MX
    3420   3430   3450   3460   4040   5040
    7010   7020   8010

FA(
    3430   3470   4050   4060   5060   6050
    6090   6150   6190   7060   8020   8040
    8050   8060

I
    3460   3470   3470   3480   4040   4050
    4060   4070   4100   6020   6030   6120
    7010   7020   7140   8010   8020   8040
    8050   8060   8070

N
    5030   5040   5050   5060   5060   6020
    6030   6130   6140   6150   6180   6190
    6210

J
    6010   6110   6110   6130   6170   7020
    7030   7040

F
    6030   6040   6040   6050   6070   6080
    6090   7040   7050   7050   7060

CT
    6080   6080   6180   6180   7100   8050
    8050   8120   8140   8150   8160

SS
    6140   6140   7080   8100   8140   8150
    8160

K
    7030   7040   7130

S
    18010 18030 19010 19020

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   FACTOR GAME BY GARY ORWIG
1000 REM INITIALIZE
1010 DIM FA(100)
1020 REM USE FULL SCREEN
1030 POKE 82,0
1040 CLS
2000 REM   INTRODUCTION
2010 L = 12
2020 GOSUB 18000
2030 PRINT "                    FACTORS"
2040 GOSUB 18000
2050 D = 1000
2060 GOSUB 19000
2070 GOSUB 18000
2080 PRINT "WHAT IS YOUR NAME?"
2090 GOSUB 18000
2100 INPUT NA$
2110 GOSUB 18000
2120 PRINT "I'M HAPPY TO MEET YOU, ";NA$;"."
2130 GOSUB 18000
2140 GOSUB 19000
2150 GOSUB 18000
2160 PRINT "THIS IS A GAME OF FACTORS.  BEFORE WE"
2170 PRINT "GO VERY FAR, I'D BETTER CHECK TO MAKE"
2180 PRINT "SURE YOU KNOW JUST WHAT FACTORS ARE!"
2190 PRINT
2200 PRINT "WHAT NUMBER IS NOT A FACTOR OF 12?"
2210 PRINT
2220 PRINT "        1"
2230 PRINT "        3"
2240 PRINT "        4"
2250 PRINT "        6"
2260 PRINT "        8"
2270 PRINT "        12"
2280 L = 4
2290 GOSUB 18000
2300 INPUT SA
2310 IF SA = 8 THEN 2730
2320 GOSUB 18000
2330 PRINT " 1, 3, 4, 6, 8, 12"
2340 PRINT
2350 PRINT "THE NUMBER '8' IS THE ONLY NUMBER LISTED"
2360 PRINT "WHICH IS NOT A FACTOR OF 12!"
```

```
2370 PRINT
2380 PRINT "IT IS THE ONLY NUMBER IN THE SET WHICH"
2390 PRINT "HAS A REMAINDER WHEN DIVIDED INTO"
2400 PRINT "THE NUMBER '12.'  ALL OF THE OTHER"
2410 PRINT "NUMBERS IN THE SET DIVIDE INTO 12"
2420 PRINT "EVENLY."
2430 PRINT
2440 PRINT "ONE NUMBER IS A FACTOR OF ANOTHER"
2450 PRINT "NUMBER IF IT DIVIDES INTO THE NUMBER"
2460 PRINT "EVENLY."
2470 PRINT
2480 GOSUB 17000
2490 L = 12
2500 GOSUB 18000
2510 PRINT "LET'S TRY ONE MORE."
2520 PRINT
2530 PRINT "WHICH OF THE FOLLOWING IS NOT A FACTOR"
2540 PRINT "OF THE NUMBER 10?"
2550 PRINT
2560 PRINT "        1"
2570 PRINT "        2"
2580 PRINT "        3"
2590 PRINT "        5"
2600 PRINT "        10"
2610 L = 6
2620 GOSUB 18000
2630 INPUT SA
2640 IF SA = 3 THEN 2730
2650 PRINT "THE NUMBER '3' IS THE ONLY NUMBER WHICH"
2660 PRINT "DOES NOT DIVIDE INTO 10 EVENLY!"
2670 PRINT "I THINK WE BETTER BACK UP A BIT, ";NA$
2680 PRINT
2690 GOSUB 17000
2700 L = 12
2710 GOSUB 18000
2720 GOTO 2200
2730 L = 12
2740 GOSUB 18000
2750 PRINT "VERY GOOD, ";NA$;"!  I THINK YOU ARE"
2760 PRINT "READY FOR THE GAME!"
2770 GOSUB 18000
2780 D = 2500
2790 GOSUB 19000
2800 GOSUB 18000
3000 REM  INSTRUCTIONS
3010 L = 12
3020 GOSUB 18000
3030 PRINT "THIS GAME IS DIFFICULT TO EXPLAIN,"
3040 PRINT "BUT YOU WILL CATCH ON QUICKLY!"
3050 PRINT
3060 PRINT "I WILL GIVE YOU A SET OF NUMBERS,"
3070 PRINT "LIKE THIS:"
3080 PRINT
3090 PRINT "1  2  3  4  5  6  7  8  9  10"
3100 PRINT
3110 PRINT "WHEN YOU PICK A NUMBER,"
```

```
3120 PRINT "LIKE '10,' YOU"
3130 PRINT "GET TO ADD IT TO YOUR SCORE."
3140 L = 5
3150 GOSUB 18000
3160 GOSUB 17000
3170 L = 12
3180 GOSUB 18000
3190 PRINT "BUT..........."
3200 PRINT
3210 PRINT "I GET TO ADD ITS REMAINING FACTORS"
3220 PRINT "(5, 2, AND 1) TO MY SCORE!"
3230 PRINT
3240 PRINT "NOW THE LIST WILL BE MISSING ALL THOSE"
3250 PRINT "NUMBERS!"
3260 PRINT
3270 PRINT "*  *  3  4  *  6  7  8  9  *"
3280 PRINT
3290 PRINT "AND WE START AGAIN!"
3300 PRINT
3310 PRINT "IF YOU PICK A NUMBER WHICH HAS NO "
3320 PRINT "FACTORS LEFT IN THE LIST, I GET IT!"
3330 PRINT "ALSO, I GET ALL THE NUMBERS LEFT OVER"
3340 PRINT "WHEN ALL THE FACTORS ARE GONE!"
3350 PRINT
3360 PRINT
3370 PRINT "READY?"
3380 GOSUB 17000
3390 I=0
3400 PRINT
3410 PRINT "WHAT IS THE LARGEST NUMBER YOU WANT (LESS THAN 1
00)?"
3420 INPUT MX
3430 IF MX > 100 THEN 3410
3440 PRINT
3450 PRINT "THE HIGHEST NUMBER WILL BE ";MX;"."
3460 FOR I = 1 TO MX
3470 FA(I) = I
3480 NEXT I
4000 REM  START OF MAIN PROGRAM
4010 PRINT
4020 PRINT "HERE IS THE LIST OF NUMBERS:"
4030 PRINT
4040 FOR I = 1 TO MX
4050 IF FA(I) = 0 THEN PRINT " * ";
4060 IF FA(I) <> 0 THEN PRINT FA(I);
4070 NEXT I
4080 PRINT
5000 REM  INPUT NUMBER
5010 PRINT
5020 PRINT "PICK A NUMBER."
5030 INPUT N
5040 IF N > MX THEN 5070
5050 IF N < 1 THEN 5070
5060 IF FA(N) = N THEN 6000
5070 PRINT
5080 PRINT "THAT NUMBER ISN'T IN THE LIST!"
```

```
5090 PRINT "TRY AGAIN!"
5100 GOTO 5030
6000 REM   FIND FACTORS
6010 J = 0
6020 FOR I = 2 TO N
6030 F = N / I
6040 IF F <  >  INT (F) THEN 6110
6050 IF FA(F) = 0 THEN 6110
6060 PRINT
6070 PRINT "I GET ";F;"!"
6080 CT = CT + F
6090 FA(F) = 0
6100 GOTO 6120
6110 J = J + 1
6120 NEXT I
6130 IF J = N - 1 THEN 6170
6140 SS = SS + N
6150 FA(N) = 0
6160 GOTO 7000
6170 J = 0
6180 CT = CT + N
6190 FA(N) = 0
6200 PRINT
6210 PRINT "I GET ";N;"!  IT HAD NO FACTORS!"
6220 PRINT
7000 REM   CHECK REM. #'S FOR FACTORS
7010 FOR I = 1 TO MX
7020 J = MX - I + 1
7030 FOR K = 2 TO J
7040 F = J / K
7050 IF F <  >  INT (F) THEN 7130
7060 IF FA(F) = 0 THEN 7130
7070 PRINT
7080 PRINT "YOUR SCORE IS: ";SS
7090 PRINT
7100 PRINT "MY SCORE IS: ";CT
7110 PRINT
7120 GOTO 4000
7130 NEXT K
7140 NEXT I
7150 PRINT
8000 REM   NO FACTORS LEFT
8010 FOR I = 1 TO MX
8020 IF FA(I) = 0 THEN 8070
8030 PRINT
8040 PRINT "I GET ";FA(I)"!"
8050 CT = CT + FA(I)
8060 FA(I) = 0
8070 NEXT I
8080 PRINT
8090 PRINT
8100 PRINT "YOUR FINAL TOTAL IS: ";SS
8110 PRINT
8120 PRINT "MY FINAL TOTAL IS: ";CT
8130 PRINT
8140 IF CT > SS THEN  PRINT "I WIN, ";NA$;"!"
```

```
8150 IF SS > CT THEN  PRINT "YOU WIN, ";NA$;"!"
8160 IF SS = CT THEN  PRINT "IT'S A TIE, ";NA$;"!"
8170 END
17000 REM  PAUSE
17010 PRINT "PUSH 'RETURN'."
17020 INPUT SA$
17030 RETURN
18000 REM  SCROLLING
18010 FOR S = 1 TO L
18020 PRINT
18030 NEXT S
18040 RETURN
19000 REM  DELAY
19010 FOR S = 1 TO D
19020 NEXT S
19030 RETURN
```

TABLE OF VARIABLES

```
CT - COMPUTER SCORE
6080 6080 6180 6180 7100 8050
8050 8120 8140 8150 8160


D - DELAY
2050 2780 19010


F - FACTOR
6030 6040 6040 6050 6070 6080
6090 7040 7050 7050 7060


FA(*) - LIST OF NUMBERS
3430 3470 4050 4060 5060 6050
6090 6150 6190 7060 8020 8040
8050 8060


I - COUNTER
3460 3470 3470 3480 4040 4050
4060 4070 4100 6020 6030 6120
7010 7020 7140 8010 8020 8040
8050 8060 8070


J - COUNTER
6010 6110 6110 6130 6170 7020
7030 7040


K - COUNTER
7030 7040 7130


L - LINES OF SCROLLING
2010 2280 2490 2610 2700 2730
3010 3140 3170 18010


MX - HIGHEST NUMBER
3420 3430 3450 3460 4040 5040
7010 7020 8010
```

```
N - COUNTER
5030 5040 5050 5060 5060 6020
6030 6130 6140 6150 6180 6190
6210

NA$ - NAME
2100 2120 2670 2750 8140 8150
8160

S - COUNTER
18010 18030 19010 19020

SA - STUDENT ANSWER
2300 2310 2630 2640

SA$ - STUDENT ANSWER
17020

SS - STUDENT SCORE
6140 6140 7080 8100 8140 8150
8160

END OF VAR. LIST
```

SAMPLE RUN

```
WHAT IS YOUR NAME?


?JUDY


I'M HAPPY TO MEET YOU, JUDY.




THIS IS A GAME OF FACTORS.  BEFORE WE
GO VERY FAR, I'D BETTER CHECK TO MAKE
SURE YOU KNOW JUST WHAT FACTORS ARE!

WHAT NUMBER IS NOT A FACTOR OF 12?

            1
            3
            4
            6
            8
           12


?6


  1, 3, 4, 6, 8, 12
```

THE NUMBER '8' IS THE ONLY NUMBER LISTED
WHICH IS NOT A FACTOR OF 12!

IT IS THE ONLY NUMBER IN THE SET WHICH
HAS A REMAINDER WHEN DIVIDED INTO
THE NUMBER '12.' ALL OF THE OTHER
NUMBERS IN THE SET DIVIDE INTO 12
EVENLY.

ONE NUMBER IS A FACTOR OF ANOTHER
NUMBER IF IT DIVIDES INTO THE NUMBER
EVENLY.

PUSH 'RETURN' TO CONTINUE.
?

LET'S TRY ONE MORE.

WHICH OF THE FOLLOWING IS NOT A FACTOR
OF THE NUMBER 10?

```
        1
        2
        3
        5
       10
```

?3

VERY GOOD, JUDY! I THINK YOU ARE
READY FOR THE GAME!

THIS GAME IS DIFFICULT TO EXPLAIN,
BUT YOU WILL CATCH ON QUICKLY!

I WILL GIVE YOU A SET OF NUMBERS,
LIKE THIS:

1 2 3 4 5 6 7 8 9 10

WHEN YOU PICK A NUMBER,
LIKE '10,' YOU
GET TO ADD IT TO YOUR SCORE.

PUSH 'RETURN' TO CONTINUE.
?

BUT..........

I GET TO ADD ITS REMAINING FACTORS
(5, 2, AND 1) TO MY SCORE!

NOW THE LIST WILL BE MISSING ALL THOSE
NUMBERS!

* * 3 4 * 6 7 8 9 *

AND WE START AGAIN!

IF YOU PICK A NUMBER WHICH HAS NO
FACTORS LEFT IN THE LIST, I GET IT!
ALSO, I GET ALL THE NUMBERS LEFT OVER
WHEN ALL THE FACTORS ARE GONE!

READY?
PUSH 'RETURN' TO CONTINUE.
?

WHAT IS THE LARGEST NUMBER YOU WANT?
?12

THE HIGHEST NUMBER WILL BE 12.

HERE IS THE LIST OF NUMBERS:

1 2 3 4 5 6 7 8 9 10 11 12

PICK A NUMBER.
?11

I GET 1!

YOUR SCORE IS: 11

MY SCORE IS: 1

HERE IS THE LIST OF NUMBERS:

* 2 3 4 5 6 7 8 9 10 * 12

PICK A NUMBER.
?10

I GET 5!

I GET 2!

YOUR SCORE IS: 21

MY SCORE IS: 8

```
HERE IS THE LIST OF NUMBERS:

*  *  3  4  *  6  7  8  9  *  *  12

PICK A NUMBER.
?9

I GET 3!

YOUR SCORE IS: 30

MY SCORE IS: 11


HERE IS THE LIST OF NUMBERS:

*  *  *  4  *  6  7  8  *  *  *  12

PICK A NUMBER.
?12

I GET 6!

I GET 4!


I GET 7!

I GET 8!


YOUR FINAL TOTAL IS: 42

MY FINAL TOTAL IS: 36

YOU WIN, JUDY!
```

Math Teacher
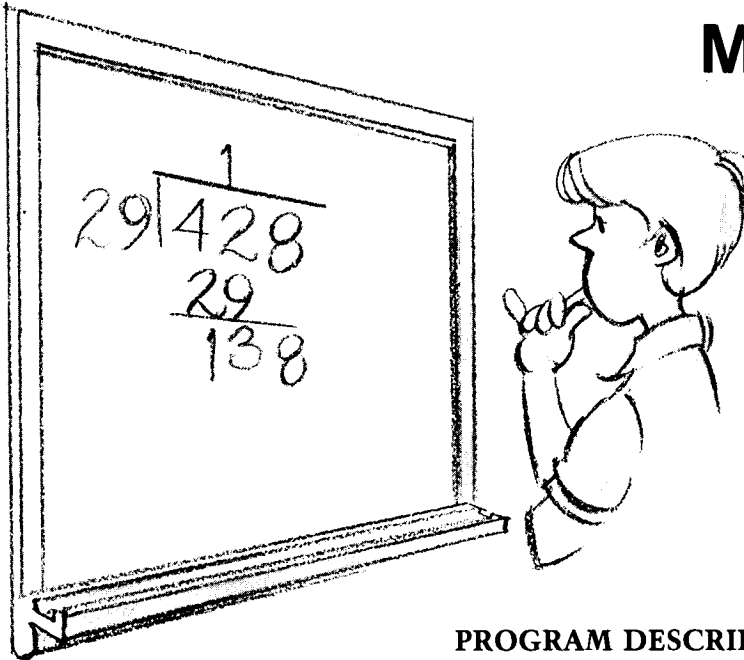
PROGRAM DESCRIPTION

This is an excellent program for practicing addition, subtraction, multiplication, and division on a more difficult scale than MATH TUTOR. The computer presents math problems that become more difficult as you answer the problems correctly. If you answer the questions incorrectly, the computer will adjust its math problems according to your skill level.

PROGRAM NOTES

1. Compare this program to MATH TUTOR to see how they differ. Pay close attention to the variable "MX" and see how it changes.

2. You may want to provide the answer after several tries.

PROGRAM LISTING: BASIC

```
100 REM MATH TEACHER BY GARY ORWIG
1000 REM INITIALIZATION
1010 DIM CH$(10)
1020 DIM NA$(50)
1030 DIM RE$(10)
1040 DIM SA$(20)
1050 REM USE FULL SCREEN
1060 REM CLEAR SCREEN
1070 POKE 82,0
1080 PRINT
2000 REM INTRODUCTION
2010 PRINT
```

```
2020 PRINT "****************************************"
2030 PRINT
2040 PRINT "                    MATH TEACHER"
2050 PRINT
2060 PRINT "****************************************"
2070 FOR T=1 TO 1000
2080 NEXT T
2090 PRINT "WHAT IS YOUR NAME";
2100 INPUT NA$
2110 PRINT
2120 PRINT
2130 PRINT "I AM HAPPY TO MEET YOU, ";NA$;"."
2140 PRINT "WE ARE GOING TO PRACTICE SOME"
2150 PRINT "MATH PROBLEMS."
2160 REM OPERATING PARAMETERS
2170 PRINT
2180 PRINT
2190 PRINT "WOULD YOU LIKE TO PRACTICE"
2200 PRINT "1. ADDITION"
2210 PRINT "2. SUBTRACTION"
2220 PRINT "3. MULTIPLICATION"
2230 PRINT "4. DIVISION"
2240 PRINT
2250 PRINT "(TYPE IN THE NUMBER YOU WANT)"
2260 INPUT CH$
2270 IF CH$="1" THEN 2350
2280 IF CH$="2" THEN 2350
2290 IF CH$="3" THEN 2350
2300 IF CH$="4" THEN 2350
2310 PRINT
2320 PRINT "PLEASE PAY ATTENTION, ";NA$
2330 PRINT "TYPE IN ONLY A 1,2,3, OR 4!"
2340 GOTO 2200
2350 PRINT
2360 PRINT "HOW MANY PROBLEMS DO YOU"
2370 PRINT "WANT, ";NA$;
2380 INPUT NU
2390 PRINT
2400 PRINT "VERY GOOD, ";NU;" IT WILL BE!"
2410 PRINT
2420 PRINT "DO YOU KNOW WHAT LEVEL YOU WANT TO"
2430 PRINT "START AT (YES OR NO)?"
2440 INPUT SA$
2450 IF SA$="YES" THEN 2510
2460 PRINT "OK, I WILL START OUT EASY AND GET"
2470 PRINT "HARDER AS WE GO."
2480 MX=10
2490 PRINT
2500 GOTO 2540
2510 PRINT "WHAT LEVEL DO YOU WANT TO START AT?"
2520 INPUT MX
2530 PRINT "OK, ";MX;" IT WILL BE!"
2540 IF CH$="4" THEN 2680
2550 PRINT
2560 PRINT "I AM NOW READY TO START!"
2570 PRINT
2580 FOR T=1 TO 200
```

```
2590 NEXT T
2600 PRINT "HERE WE GO!!"
2610 FOR T=1 TO 200
2620 NEXT T
2630 PRINT
2640 PRINT
2650 PRINT
2660 PRINT
2670 GOTO 4000
2680 PRINT
2690 PRINT "DO YOU WANT DIVISION PROBLEMS"
2700 PRINT "WITH REMAINDERS (YES OR NO)";
2710 INPUT RE$
2720 IF RE$="YES" THEN 2780
2730 IF RE$="NO" THEN 2780
2740 PRINT
2750 PRINT "JUST TYPE A 'YES' OR 'NO' PLEASE"
2760 PRINT
2770 GOTO 2680
2780 GOTO 2550
4000 REM MAIN PROGRAM
4010 IF CH$="1" THEN 4730
4020 IF CH$="2" THEN 4570
4030 IF CH$="3" THEN 4470
4040 IF RE$="YES" THEN 4220
4050 REM DIVISION WITHOUT REMAINDER
4060 GOSUB 10000
4070 NP=1
4080 IF A<B THEN 4110
4090 C=A/B
4100 GOTO 4150
4110 D=B
4120 B=A
4130 A=D
4140 GOTO 4090
4150 IF C-INT(C)>0 THEN 4060
4160 PRINT A;" DIVIDED BY ";B;" EQUALS";
4170 INPUT SA
4180 GOSUB 11000
4190 GOSUB 12000
4200 GOSUB 15000
4210 GOTO 4050
4220 REM DIVISION WITH REMAINDER
4230 GOSUB 10000
4240 NP=1
4250 IF A<B THEN 4290
4260 C=INT(A/B)
4270 RE=A-(C*B)
4280 GOTO 4330
4290 D=B
4300 B=A
4310 A=D
4320 GOTO 4260
4330 PRINT
4340 PRINT A;" DIVIDED BY ";B;" EQUALS?"
4350 PRINT "WHAT IS THE WHOLE NUMBER";
4360 INPUT SA
```

```
4370 GOSUB 11000
4380 GOSUB 12000
4390 PRINT "AND WHAT IS THE REMAINDER?"
4400 PRINT "TYPE IN 0 IF THERE IS NONE."
4410 INPUT SA
4420 C=RE
4430 GOSUB 11000
4440 GOSUB 12000
4450 GOSUB 15000
4460 GOTO 4220
4470 REM MULTIPLICATION
4480 GOSUB 10000
4490 NP=1
4500 C=A*B
4510 PRINT A;" TIMES ";B;" EQUALS";
4520 INPUT SA
4530 GOSUB 11000
4540 GOSUB 12000
4550 GOSUB 15000
4560 GOTO 4470
4570 REM SUBTRACTION
4580 GOSUB 10000
4590 NP=1
4600 IF A<B THEN 4630
4610 C=A-B
4620 GOTO 4670
4630 D=B
4640 B=A
4650 A=D
4660 GOTO 4610
4670 PRINT A;" MINUS ";B;" EQUALS";
4680 INPUT SA
4690 GOSUB 11000
4700 GOSUB 12000
4710 GOSUB 15000
4720 GOTO 4570
4730 REM ADDITION
4740 GOSUB 10000
4750 NP=1
4760 C=A+B
4770 PRINT A;" PLUS ";B;" EQUALS";
4780 INPUT SA
4790 GOSUB 11000
4800 GOSUB 12000
4810 GOSUB 15000
4820 GOTO 4730
10000 REM RANDOMIZATION
10010 A=INT(MX*RND(0))+1
10020 B=INT(MX*RND(0))+1
10030 RETURN
11000 REM JUDGE ANSWER
11010 IF SA=C THEN 11090
11020 GOSUB 14000
11030 TR=TR+1
11040 IF TR=3 THEN 16000
11050 PRINT
11060 PRINT "TRY AGAIN!"
```

```
11070 INPUT SA
11080 GOTO 11010
11090 HT=1
11100 RETURN
12000 REM REWARDS
12010 IF HT=0 THEN RETURN
12020 MX=MX+10
12030 PRINT
12040 N=INT(5*RND(0))+1
12050 ON N GOTO 12070,12090,12110,12130,12150
12060 REM REWARDS
12070 PRINT "GREAT!"
12080 RETURN
12090 PRINT "SUPER!"
12100 RETURN
12110 PRINT "FANTASTIC!"
12120 RETURN
12130 PRINT "YOU'RE REALLY GOING NOW, ";NA$
12140 RETURN
12150 PRINT "THAT'S GREAT, ";NA$
12160 RETURN
14000 REM WRONG
14010 PRINT
14020 IF NP=0 THEN 14070
14030 WR=WR+1
14040 NP=0
14050 MX=MX-10
14060 IF MX<1 THEN MX=10
14070 N=INT(5*RND(0))+1
14080 ON N GOTO 14100,14120,14140,14160,14180
14090 REM WRONGS
14100 PRINT "OOPS!"
14110 RETURN
14120 PRINT "LOOK CLOSER, ";NA$
14130 RETURN
14140 PRINT "NO...."
14150 RETURN
14160 PRINT "ARE YOU PAYING ATTENTION, ";NA$
14170 RETURN
14180 PRINT "SORRY!"
14190 RETURN
15000 REM SCORE KEEPING
15010 TL=TL+1
15020 IF TL=NU THEN 20000
15030 RETURN
16000 REM GIVE ANSWER
16010 HT=0
16020 TR=0
16030 PRINT "THE CORRECT ANSWER IS ";C
16040 PRINT "LET'S TRY ANOTHER!"
16050 RETURN
20000 REM CLOSING
20010 PRINT
20020 PRINT "THAT'S ALL!"
20030 PRINT
20040 PRINT "I HOPE YOU HAD FUN, ";NA$
20050 PRINT
```

```
20060 PRINT
20070 PRINT
20080 PRINT "YOU HAD ";NU-WR;" OUT OF "
20090 PRINT NU;" PROBLEMS CORRECT!"
20100 PRINT "YOU FINISHED AT LEVEL ";MX;"!"
20110 END
```

TABLE OF VARIABLES

CH$

1010	2260	2270	2280	2290	2300
2540	4010	4020	4030		

NA$

1020	2100	2130	2320	2370	12130
12150	14120	14160	20040		

RE$

1030	2710	2720	2730	4040

SA$

1040	2440	2450

T

2070	2080	2580	2590	2610	2620

NU

2380	2400	15020	20080	20090

MX

2480	2520	2530	10010	10020	12020
12020	14050	14050	14060	14060	20100

NP

4070	4240	4490	4590	4750	14020
14040					

A

4080	4090	4120	4130	4160	4250
4260	4270	4300	4310	4340	4500
4510	4600	4610	4640	4650	4670
4760	4770	10010			

B

4080	4090	4110	4120	4160	4250
4260	4270	4290	4300	4340	4500
4510	4600	4610	4630	4640	4670
4760	4770	10020			

C

4090	4150	4150	4260	4270	4420
4500	4610	4760	11010	16030	

D
4110   4130   4290   4310   4630   4650

SA
4170   4360   4410   4520   4680   4780
11010   11070

RE
4270   4420

TR
11030   11030   11040   16020

HT
11090   12010   16010

N
12040   12050   14070   14080

WR
14030   14030   20080

TL
15010   15010   15020

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   MATH TEACHER BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM INITIALIZE
1010 REM USE FULL SCREEN
1020 POKE 82,0
1030 CLS
2000 REM   INTRODUCTION
2010 PRINT
2020 PRINT "***************************************"
2030 PRINT
2040 PRINT "             MATH TEACHER"
2050 PRINT
2060 PRINT "***************************************"
2070 FOR T = 1 TO 1000
2080 NEXT T
2090 PRINT "WHAT IS YOUR NAME";
2100 INPUT NA$
2110 PRINT
2120 PRINT
2130 PRINT "I AM HAPPY TO MEET YOU, ";NA$;"."
2140 PRINT "WE ARE GOING TO PRACTICE SOME"
2150 PRINT "MATH PROBLEMS."
2160 REM   OPERATING PARAMETERS
2170 PRINT
2180 PRINT
```

```
2190 PRINT "WOULD YOU LIKE TO PRACTICE
2200 PRINT "1. ADDITION"
2210 PRINT "2. SUBTRACTION"
2220 PRINT "3. MULTIPLICATION"
2230 PRINT "4. DIVISION"
2240 PRINT
2250 PRINT "(TYPE IN THE NUMBER YOU WANT)"
2260 INPUT CH$
2270 IF CH$ = "1" THEN 2350
2280 IF CH$ = "2" THEN 2350
2290 IF CH$ = "3" THEN 2350
2300 IF CH$ = "4" THEN 2350
2310 PRINT
2320 PRINT "PLEASE PAY ATTENTION, "NA$
2330 PRINT "TYPE IN ONLY A 1,2,3, OR 4!"
2340 GOTO 2200
2350 PRINT
2360 PRINT "HOW MANY PROBLEMS DO YOU"
2370 PRINT "WANT, ";NA$;
2380 INPUT NU
2390 PRINT
2400 PRINT "VERY GOOD, ";NU;" IT WILL BE!"
2410 PRINT
2420 PRINT "DO YOU KNOW WHAT LEVEL YOU WANT TO"
2430 PRINT "START AT (YES OR NO)?"
2440 INPUT SA$
2450 IF SA$ = "YES" THEN 2510
2460 PRINT "OK, I WILL START OUT EASY AND GET"
2470 PRINT "HARDER AS WE GO."
2480 MX = 10
2490 PRINT
2500 GOTO 2540
2510 PRINT "WHAT LEVEL DO YOU WANT TO START AT?"
2520 INPUT MX
2530 PRINT "OK, ";MX;" IT WILL BE!"
2540 IF CH$ = "4" THEN 2680
2550 PRINT
2560 PRINT "I AM NOW READY TO START!"
2570 PRINT
2580 FOR T = 1 TO 500
2590 NEXT T
2600 PRINT "HERE WE GO!!"
2610 FOR T = 1 TO 500
2620 NEXT T
2630 PRINT
2640 PRINT
2650 PRINT
2660 PRINT
2670 GOTO 4000
2680 PRINT
2690 PRINT "DO YOU WANT DIVISION PROBLEMS"
2700 PRINT "WITH REMAINDERS (YES OR NO)";
2710 INPUT RE$
2720 IF RE$ = "YES" THEN 2780
2730 IF RE$ = "NO" THEN 2780
2740 PRINT
2750 PRINT "JUST TYPE A 'YES' OR 'NO' PLEASE"
```

```
2760 PRINT
2770 GOTO 2680
2780 GOTO 2550
4000 REM   MAIN PROGRAM
4010 IF CH$ = "1" THEN 4730
4020 IF CH$ = "2" THEN 4570
4030 IF CH$ = "3" THEN 4470
4040 IF RE$ = "YES" THEN 4220
4050 REM   DIVISION WITHOUT REMAINDER
4060 GOSUB 10000
4070 NP = 1
4080 IF A < B THEN 4110
4090 C = A / B
4100 GOTO 4150
4110 D = B
4120 B = A
4130 A = D
4140 GOTO 4090
4150 IF C -   INT (C) > 0 THEN 4060
4160 PRINT A;" DIVIDED BY ";B;" EQUALS";
4170 INPUT SA
4180 GOSUB 11000
4190 GOSUB 12000
4200 GOSUB 15000
4210 GOTO 4050
4220 REM   DIVISION WITH REMAINDER
4230 GOSUB 10000
4240 NP = 1
4250 IF A < B THEN 4290
4260 C =   INT (A / B)
4270 RE = A - (C * B)
4280 GOTO 4330
4290 D = B
4300 B = A
4310 A = D
4320 GOTO 4260
4330 PRINT
4340 PRINT A;" DIVIDED BY ";B;" EQUALS?"
4350 PRINT "WHAT IS THE WHOLE NUMBER";
4360 INPUT SA
4370 GOSUB 11000
4380 GOSUB 12000
4390 PRINT "AND WHAT IS THE REMAINDER?"
4400 PRINT "TYPE IN 0 IF THERE IS NONE."
4410 INPUT SA
4420 C = RE
4430 GOSUB 11000
4440 GOSUB 12000
4450 GOSUB 15000
4460 GOTO 4220
4470 REM   MULTIPLICATION
4480 GOSUB 10000
4490 NP = 1
4500 C = A * B
4510 PRINT A;" TIMES ";B;" EQUALS";
4520 INPUT SA
4530 GOSUB 11000
```

```
4540 GOSUB 12000
4550 GOSUB 15000
4560 GOTO 4470
4570 REM   SUBTRACTION
4580 GOSUB 10000
4590 NP = 1
4600 IF A < B THEN 4630
4610 C = A - B
4620 GOTO 4670
4630 D = B
4640 B = A
4650 A = D
4660 GOTO 4610
4670 PRINT A;" MINUS ";B;" EQUALS";
4680 INPUT SA
4690 GOSUB 11000
4700 GOSUB 12000
4710 GOSUB 15000
4720 GOTO 4570
4730 REM   ADDITION
4740 GOSUB 10000
4750 NP = 1
4760 C = A + B
4770 PRINT A;" PLUS ";B;" EQUALS";
4780 INPUT SA
4790 GOSUB 11000
4800 GOSUB 12000
4810 GOSUB 15000
4820 GOTO 4730
10000 REM    RANDOMIZATION
10010 A =   RND(MX)
10020 B =   RND(MX)
10030 RETURN
11000 REM  JUDGE ANSWER
11010 IF SA = C THEN 11090
11020 GOSUB 14000
11030 TR = TR + 1
11040 IF TR = 3 THEN 16000
11050 PRINT
11060 PRINT "TRY AGAIN!"
11070 INPUT SA
11080 GOTO 11010
11090 HT = 1
11100 RETURN
12000 REM    REWARDS
12010 IF HT = 0 THEN   RETURN
12020 MX = MX + 10
12030 PRINT
12040 N =   RND(5)
12050 ON N GOTO 12070,12090,12110,12130,12150
12060 REM   REWARDS
12070 PRINT "GREAT!"
12080 RETURN
12090 PRINT "SUPER!"
12100 RETURN
12110 PRINT "FANTASTIC!"
```

```
12120 RETURN
12130 PRINT "YOU'RE REALLY GOING NOW, ";NA$
12140 RETURN
12150 PRINT "THAT'S GREAT, ";NA$
12160 RETURN
14000 REM    WRONG
14010 PRINT
14020 IF NP = 0 THEN 14070
14030 WR = WR + 1
14040 NP = 0
14050 MX = MX - 10
14060 IF MX < 1 THEN MX = 10
14070 N =   RND(5)
14080 ON N GOTO 14100,14120,14140,14160,14180
14090 REM    WRONGS
14100 PRINT "OOPS!"
14110 RETURN
14120 PRINT "LOOK CLOSER, ";NA$
14130 RETURN
14140 PRINT "NO...."
14150 RETURN
14160 PRINT "ARE YOU PAYING ATTENTION, ";NA$
14170 RETURN
14180 PRINT "SORRY!"
14190 RETURN
15000 REM  SCORE KEEPING
15010 TL = TL + 1
15020 IF TL = NU THEN 20000
15030 RETURN
16000 REM  GIVE ANSWER
16010 HT = 0
16020 TR = 0
16030 PRINT "THE CORRECT ANSWER IS ";C
16040 PRINT "LET'S TRY ANOTHER!"
16050 RETURN
20000 REM  CLOSING
20010 PRINT
20020 PRINT "THAT'S ALL!"
20030 PRINT
20040 PRINT "I HOPE YOU HAD FUN, ";NA$
20050 PRINT
20060 PRINT
20070 PRINT
20080 PRINT "YOU HAD ";NU - WR;" OUT OF "
20090 PRINT NU;" PROBLEMS CORRECT!"
20100 PRINT "YOU FINISHED AT LEVEL ";MX;"!"
20110 END
```

TABLE OF VARIABLES

```
A - ONE NUMBER
4080 4090 4120 4130 4160 4250
4260 4270 4300 4310 4340 4500
4510 4600 4610 4640 4650 4670
4760 4770 10010
```

B — THE OTHER NUMBER
4080 4090 4110 4120 4160 4250
4260 4270 4290 4300 4340 4500
4510 4600 4610 4630 4640 4670
4760 4770 10020

C — CORRECT ANSWER
4090 4150 4150 4260 4270 4420
4500 4610 4760 11010 16030

CH$ — STUDENT CHOICE
2260 2270 2280 2290 2300 2540
4010 4020 4030

D — TRANSFER VARIABLE
4110 4130 4290 4310 4630 4650

HT — HIT
11090 12010 16010

MX — MAXIMUM FOR A AND B
2480 2520 2530 10010 10020
12020 12020 14050 14050 14060
14060 20100

N — RANDOM NUMBER
12040 12050 14070 14080

NA$ — NAME
2100 2130 2320 2370 12130 12150
14120 14160 20040

NP — FLAG FOR WRONG ANSWER
4070 4240 4490 4590 4750 14020
14040

NU — NUMBER OF PROBLEMS
2380 2400 15020 20080 20090

RE — REMAINDER
4270 4420

RE$ — FLAG FOR DIVISION WITH REMAINDER
2710 2720 2730 4040

SA — STUDENT ANSWER
4170 4360 4410 4520 4680 4780
11010 11070

SA$ — STUDENT ANSWER
2440 2450

T — DELAY
2070 2080 2580 2590 2610 2620

TL — NUMBER OF PROBLEMS WORKED
15010 15010 15020

```
TR - NUMBER OF TRIES
11030 11030 11040 16020

WR - NUMBER WRONG
14030 14030 20080

END OF VAR. LIST
```

SAMPLE RUN

```
WHAT IS YOUR NAME?RANDY


I AM HAPPY TO MEET YOU, RANDY.
WE ARE GOING TO PRACTICE SOME
MATH PROBLEMS.


WOULD YOU LIKE TO PRACTICE:
1. ADDITION
2. SUBTRACTION
3. MULTIPLICATION
4. DIVISION

(TYPE IN THE NUMBER YOU WANT)
?3

HOW MANY PROBLEMS DO YOU
WANT, RANDY?5

VERY GOOD, 5 IT WILL BE!

DO YOU KNOW WHAT LEVEL YOU WANT TO
START AT (YES OR NO)?
?NO
OK, I WILL START OUT EASY AND GET
HARDER AS WE GO.


I AM NOW READY TO START!

HERE WE GO!!



3 TIMES 2 EQUALS?6

SUPER!
9 TIMES 2 EQUALS?18

GREAT!
3 TIMES 11 EQUALS?33

THAT'S GREAT, RANDY
32 TIMES 20 EQUALS?620
```

```
OOPS!

TRY AGAIN!
?640

THAT'S GREAT, RANDY
30 TIMES 17 EQUALS?510

FANTASTIC!

THAT'S ALL!

I HOPE YOU HAD FUN, RANDY


YOU HAD 4 OUT OF
5 PROBLEMS CORRECT!
YOU FINISHED AT LEVEL 50!
```
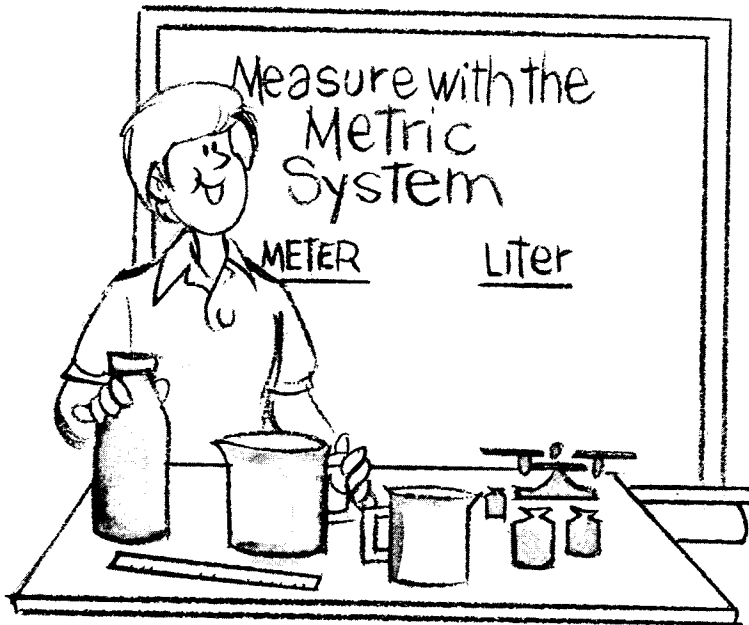
Metrics

PROGRAM DESCRIPTION

Understanding the metric system is essential in communicating knowledge among the nations of the world as well as developing skills to work within the realms of science. In this program the computer gives you an initial quiz (pre-test) on metrics and if you get all of the answers correct you don't have to continue the program. For those of you who don't receive a perfect score on the pre-test, the computer instructs you on metrics and then gives you a test at the end of the instruction (a post-test). If you receive less than a perfect score on the post-test, the computer will send you back to the part of the instruction that you missed in the post-test.

PROGRAM NOTES

1. Vary the text and questions to match your needs.

2. Notice line 4500. It allows either "1" or "2.5" to be entered as the correct answer. Consider using A, B, C, or D as the multiple choice selections.

PROGRAM LISTING: BASIC

```
100 REM METRICS BY GARY ORWIG
1000 REM INITIALIZATION
1010 DIM SA$(10)
1020 REM USE FULL SCREEN
```

```
1030 POKE 82,0
1040 PRINT
2000 REM INTRODUCTION
2010 L=12
2020 GOSUB 18000
2030 PRINT "            METRICS"
2040 GOSUB 18000
2050 D=200
2060 GOSUB 19000
2070 GOSUB 18000
2080 PRINT "THIS IS A PROGRAM ABOUT THE METRIC"
2090 PRINT "SYSTEM."
2100 PRINT
2110 PRINT "WOULD YOU LIKE TO TAKE A QUIZ TO SEE"
2120 PRINT "IF YOU ALREADY KNOW ABOUT THE METRIC"
2130 PRINT "SYSTEM (YES OR NO)?"
2140 L=6
2150 GOSUB 18000
2160 INPUT SA$
2170 IF SA$="YES" THEN 2220
2180 PRINT "LET'S LOOK AT THE METRIC SYSTEM!"
2190 D=200
2200 GOSUB 19000
2210 GOTO 3000
2220 GOSUB 7000
2230 GOTO 20000
3000 REM GUIDING PROGRAM
3010 GOSUB 4000
3020 GOSUB 5000
3030 GOSUB 6000
3040 GOSUB 7000
3050 GOTO 20000
4000 REM DISTANCE
4010 L=24
4020 GOSUB 18000
4030 PRINT "THE BASIC UNIT OF LENGTH IN THE METRIC"
4040 PRINT "SYSTEM IS THE 'METER.'  AT FIRST THE"
4050 PRINT "METER WAS DEFINED AS ONE TEN MILLIONTH"
4060 PRINT "THE DISTANCE FROM THE EQUATOR TO THE"
4070 PRINT "NORTH POLE.  HOWEVER, IT SOON BECAME"
4080 PRINT "EVIDENT THAT THIS DISTANCE IS VERY HARD"
4090 PRINT "TO MEASURE EVERY TIME THE STANDARD"
4100 PRINT "NEEDED TO BE CHECKED!"
4110 PRINT
4120 PRINT "PRESENTLY THE METER IS DEFINED ON THE"
4130 PRINT "BASIS OF A VERY ACCURATELY MEASURED"
4140 PRINT "WAVELENGTH OF LIGHT."
4150 L=6
4160 GOSUB 18000
4170 GOSUB 17000
4180 L=24
4190 GOSUB 18000
4200 PRINT "THE METRIC UNITS OF LENGTH WHICH ARE"
4210 PRINT "COMMONLY USED ARE:"
4220 PRINT
4230 PRINT "    MILLIMETER"
4240 PRINT "    CENTIMETER"
```

```
4250 PRINT "     METER"
4260 PRINT "     KILOMETER"
4270 PRINT
4280 PRINT "THE MILLIMETER IS 1/1000 OF A METER"
4290 PRINT "                    1/10 OF A CENTIMETER"
4300 PRINT
4310 PRINT "THE CENTIMETER IS 1/100 OF A METER"
4320 PRINT
4330 PRINT "THE KILOMETER IS 1000 METERS."
4340 L=6
4350 GOSUB 18000
4360 GOSUB 17000
4370 L=24
4380 GOSUB 18000
4390 PRINT "LET'S TRY A COUPLE OF SIMPLE CONVERSION"
4400 PRINT "PROBLEMS."
4410 PRINT
4420 PRINT "25 MILLIMETERS EQUALS:"
4430 PRINT "     1.   2.5"
4440 PRINT "     2.    .25"
4450 PRINT "     3. 32."
4460 PRINT "            CENTIMETERS"
4470 L=8
4480 GOSUB 18000
4490 INPUT SA
4500 IF SA=2.5 THEN SA=1
4510 ON SA GOTO 4520,4540,4570
4520 GOSUB 12000
4530 GOTO 4600
4540 PRINT "10 MILLIMETERS EQUAL 1 CENTIMETER."
4550 PRINT "25 MILLIMETERS EQUAL ? CENTIMETERS.";
4560 GOTO 4490
4570 GOSUB 11010
4580 PRINT
4590 GOTO 4410
4600 PRINT "HERE IS ANOTHER PROBLEM."
4610 PRINT
4620 PRINT ".52 KILOMETERS EQUALS:"
4630 PRINT
4640 PRINT "     1. 52 METERS"
4650 PRINT "     2. 760 METERS"
4660 PRINT "     3. 520 METERS"
4670 PRINT
4680 L=7
4690 GOSUB 18000
4700 INPUT SA
4710 IF SA=520 THEN SA=3
4720 ON SA GOTO 4730,4760,4790
4730 PRINT "1 KILOMETER EQUALS 1000 METERS"
4740 PRINT ".52 KILOMETERS EQUALS ? METERS";
4750 GOTO 4700
4760 GOSUB 11010
4770 PRINT "THINK ABOUT IT!"
4780 GOTO 4610
4790 GOSUB 12000
4800 RETURN
5000 REM VOLUME
```

```
5010 L=12
5020 GOSUB 18000
5030 PRINT "THE METRIC UNIT FOR VOLUME IS BASED"
5040 PRINT "UPON THE METRIC UNIT OF LENGTH."
5050 PRINT
5060 PRINT "IF A CUBE WERE CONSTRUCTED SO THAT IT"
5070 PRINT "WAS EXACTLY .1 METERS ON EACH SIDE,"
5080 PRINT "IT COULD HOLD ONE LITER OF MATERIAL."
5090 PRINT
5100 PRINT "THE LITER, THEN, IS THE BASIC METRIC"
5110 PRINT "UNIT FOR VOLUME.  THE LITER IS NOT TOO"
5120 PRINT "DIFFERENT IN SIZE FROM THE QUART."
5130 PRINT
5140 PRINT "IF A CUBE WERE FORMED EXACTLY ONE"
5150 PRINT "CENTIMETER ON A SIDE, WE WOULD CALL IT"
5160 PRINT "A 'CUBIC CENTIMETER.'  THIS VERY SMALL"
5170 PRINT "UNIT IS EXACTLY .001 LITERS, SO WE"
5180 PRINT "ALSO CALL IT A 'MILLILITER.'"
5190 PRINT
5200 PRINT "THE TERM 'CUBIC CENTIMETER' OR 'CC' AND"
5210 PRINT "THE TERM 'MILLILITER' OR 'ML' BOTH"
5220 PRINT "MEAN THE SAME AMOUNT OF VOLUME - "
5230 PRINT "ONE ONE THOUSANDTH OF A LITER."
5240 PRINT
5250 GOSUB 17000
5260 L=12
5270 GOSUB 18000
5280 PRINT "HERE ARE A COUPLE OF QUESTIONS:"
5290 PRINT
5300 PRINT
5310 PRINT "HOW MANY CUBIC CENTIMETERS ARE IN A "
5320 PRINT "MILLILITER?"
5330 PRINT
5340 PRINT "          1.   1"
5350 PRINT "          2.   2"
5360 PRINT "          3. 10"
5370 L=9
5380 GOSUB 18000
5390 INPUT SA
5400 IF SA=10 THEN SA=3
5410 ON SA GOTO 5420,5450,5470
5420 GOSUB 12000
5430 PRINT "YOU ARE RIGHT!  THEY ARE THE SAME!"
5440 GOTO 5520
5450 GOSUB 11170
5460 GOTO 5290
5470 PRINT
5480 PRINT "YOU DID NOT READ VERY CLOSELY!"
5490 PRINT "THERE IS SOMETHING VERY 'UNIQUE'"
5500 PRINT "ABOUT THESE TWO UNITS!"
5510 GOTO 5290
5520 PRINT
5530 PRINT "WHAT IS THE VOLUME OF A BOX (IN LITERS)"
5540 PRINT "IF IT MEASURES .50 METERS BY .30 METERS"
5550 PRINT "BY .20 METERS?"
5560 PRINT
5570 PRINT "     1. 50 LITERS"
```

```
5580 PRINT "    2. 30 LITERS"
5590 PRINT "    3. 10 LITERS"
5600 L=8
5610 GOSUB 18000
5620 INPUT SA
5630 IF SA=50 THEN SA=1
5640 IF SA=30 THEN SA=2
5650 IF SA=10 THEN SA=3
5660 ON SA GOTO 5690,5670,5690
5670 GOSUB 12000
5680 GOTO 5860
5690 PRINT
5700 PRINT
5710 PRINT "REMEMBER THAT A LITER IS DEFINED AS THE"
5720 PRINT "VOLUME OF A CUBE .10 METERS ON EACH"
5730 PRINT "SIDE.  ALTHOUGH THE TERM FOR .10 METER"
5740 PRINT "ISN'T USED VERY MUCH, IT IS CALLED A"
5750 PRINT "'DECIMETER.'  IF YOU CONVERT THE METER"
5760 PRINT "MEASUREMENTS TO DECIMETERS (.5 METERS"
5770 PRINT "EQUALS 5. DECIMETERS) AND MULTIPLY ALL"
5780 PRINT "THREE TOGETHER, YOU WILL END UP WITH"
5790 PRINT "THE VOLUME IN CUBIC DECIMETERS OR"
5800 PRINT "WHAT WE CALL LITERS!"
5810 PRINT
5820 GOSUB 17000
5830 L=12
5840 GOSUB 18000
5850 GOTO 5520
5860 L=12
5870 GOSUB 18000
5880 RETURN
6000 REM MASS
6010 L=12
6020 GOSUB 18000
6030 PRINT "THE METRIC UNIT FOR MASS IS THE 'GRAM.'"
6040 PRINT "ORIGINALLY THE GRAM WAS DEFINED AS THE"
6050 PRINT "MASS OF 1 CUBIC CENTIMETER OF WATER"
6060 PRINT "UNDER CONTROLLED CONDITIONS."
6070 PRINT "NOW THERE ARE MORE ACCURATE METHODS FOR"
6080 PRINT "DEFINING THE GRAM."
6090 PRINT
6100 PRINT "SINCE THE GRAM IS A SMALL UNIT OF"
6110 PRINT "MEASURE (A NICKEL HAS A MASS OF ABOUT"
6120 PRINT "5 GRAMS), A LARGER UNIT IS ALSO USED."
6130 PRINT "THE 'KILOGRAM' IS 1000 GRAMS."
6140 PRINT
6150 PRINT
6160 GOSUB 17000
6170 PRINT "HERE ARE A COUPLE OF QUESTIONS."
6180 PRINT
6190 L=6
6200 GOSUB 18000
6210 PRINT "UNDER CONTROLLED CONDITIONS, WHAT WOULD"
6220 PRINT "BE THE MASS OF 1.0 LITER OF WATER?"
6230 PRINT "    1. 10 GRAMS"
6240 PRINT "    2. 100 GRAMS"
6250 PRINT "    3. 1000 GRAMS"
```

```
6260 L=8
6270 GOSUB 18000
6280 INPUT SA
6290 IF SA=10 THEN SA=1
6300 IF SA=100 THEN SA=2
6310 IF SA=1000 THEN SA=3
6320 ON SA GOTO 6330,6330,6430
6330 L=12
6340 GOSUB 18000
6350 PRINT "A LITER CONTAINS 1000 CUBIC CENTIMETERS."
6360 PRINT "SINCE A CUBIC CENTIMETER OF WATER HAS A"
6370 PRINT "MASS OF 1.0 GRAM, WHAT WOULD BE THE"
6380 PRINT "MASS OF 1000 CUBIC CENTIMETERS OF WATER?"
6390 L=7
6400 GOSUB 18000
6410 GOSUB 17000
6420 GOTO 6190
6430 GOSUB 12000
6440 L=12
6450 GOSUB 18000
6460 PRINT "HOW MANY GRAMS ARE IN .450 KILOGRAMS?"
6470 PRINT "      1. 45.0 "
6480 PRINT "      2. 450"
6490 PRINT "      3. 900"
6500 L=9
6510 GOSUB 18000
6520 INPUT SA
6530 IF SA=45 THEN SA=1
6540 IF SA=450 THEN SA=2
6550 IF SA=900 THEN SA=3
6560 ON SA GOTO 6570,6640,6660
6570 GOSUB 11170
6580 PRINT
6590 PRINT "1.0 KILOGRAMS = 1000 GRAMS"
6600 PRINT ".450 KILOGRAMS = ? GRAMS"
6610 PRINT
6620 L=6
6630 GOTO 6450
6640 GOSUB 12000
6650 GOTO 6680
6660 GOSUB 11010
6670 GOTO 6440
6680 RETURN
7000 REM POST TEST
7010 L=12
7020 GOSUB 18000
7030 PRINT "            QUIZ!"
7040 L=6
7050 GOSUB 18000
7060 PRINT "WHAT IS THE METRIC UNIT FOR VOLUME?"
7070 PRINT
7080 PRINT "      1. METER"
7090 PRINT "      2. LITER"
7100 PRINT "      3. GRAM "
7110 L=8
7120 GOSUB 18000
```

```
7130 INPUT SA
7140 ON SA GOTO 7150,7170,7150
7150 V=0
7160 GOTO 7180
7170 V=1
7180 L=12
7190 GOSUB 18000
7200 PRINT "HOW MANY CENTIMETERS ARE IN 2.0 METERS?"
7210 PRINT
7220 PRINT "     1. 20"
7230 PRINT "     2. 200"
7240 PRINT "     3. 2000"
7250 L=8
7260 GOSUB 18000
7270 INPUT SA
7280 IF SA=20 THEN SA=1
7290 IF SA=200 THEN SA=2
7300 IF SA=2000 THEN SA=3
7310 ON SA GOTO 7320,7340,7320
7320 DI=0
7330 GOTO 7350
7340 DI=1
7350 L=12
7360 GOSUB 18000
7370 PRINT "2500 GRAMS WOULD BE HOW MANY KILOGRAMS?"
7380 PRINT
7390 PRINT "     1. 2.5"
7400 PRINT "     2. 25"
7410 PRINT "     3. 250"
7420 L=8
7430 GOSUB 18000
7440 INPUT SA
7450 IF SA=2.5 THEN SA=1
7460 IF SA=25 THEN SA=2
7470 IF SA=250 THEN SA=3
7480 ON SA GOTO 7490,7510,7510
7490 MA=1
7500 GOTO 7520
7510 MA=0
7520 REM SUMMARY
7530 IF DI=0 THEN GOTO 7570
7540 IF V=0 THEN GOTO 7620
7550 IF MA=0 THEN GOTO 7670
7560 RETURN
7570 PRINT "WE ARE GOING TO REVIEW DISTANCE."
7580 D=200
7590 GOSUB 19000
7600 GOSUB 4000
7610 GOTO 7540
7620 PRINT "WE ARE GOING TO REVIEW VOLUME."
7630 D=200
7640 GOSUB 19000
7650 GOSUB 5000
7660 GOTO 7550
7670 PRINT "WE ARE GOING TO REVIEW MASS."
7680 D=200
```

```
7690 GOSUB 19000
7700 GOSUB 6000
7710 GOTO 7560
11000 REM CORRECTION ROUTINES
11010 PRINT
11020 PRINT
11030 PRINT "IN THE METRIC SYSTEM, CONVERSIONS ALWAYS"
11040 PRINT "ARE SOME POWER OF TEN.  FOR EXAMPLE,"
11050 PRINT "135. CENTIMETERS BECOMES 1.35 METERS."
11060 PRINT
11070 PRINT "NOTICE HOW THE SAME DIGITS ARE IN BOTH"
11080 PRINT "ANSWERS?  ONLY THE DECIMAL POINT"
11090 PRINT "(POWERS OF TEN) CHANGES."
11100 PRINT
11110 PRINT "IN A METRIC CONVERSION, ONLY THE DECIMAL"
11120 PRINT "CHANGES POSITION!"
11130 L=8
11140 GOSUB 18000
11150 GOSUB 17000
11160 RETURN
11170 PRINT
11180 PRINT "IN THE METRIC SYSTEM, ANY UNIT WILL"
11190 PRINT "ALWAYS BE SOME POWER OF TEN BIGGER OR"
11200 PRINT "SMALLER THAN ANOTHER UNIT."
11210 PRINT
11220 PRINT "(.001, .01, .1, 1, 10, 100, 1000)"
11230 PRINT
11240 PRINT "BOTH UNITS MUST MEASURE THE SAME"
11250 PRINT "PHYSICAL DIMENSION, THOUGH."
11260 PRINT "(DISTANCE, VOLUME, MASS, ETC.)"
11270 PRINT
11280 GOSUB 17000
11290 RETURN
12000 REM REWARDS
12010 L=24
12020 GOSUB 18000
12030 PRINT "VERY GOOD!"
12040 L=12
12050 GOSUB 18000
12060 D=200
12070 GOSUB 19000
12080 GOSUB 18000
12090 RETURN
17000 REM PRESS RETURN
17010 PRINT "PRESS 'RETURN' TO CONTINUE."
17020 INPUT SA$
17030 RETURN
18000 REM SCROLLING
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM DELAY
19010 FOR I=1 TO D
19020 NEXT I
19030 RETURN
```

```
20000 REM CLOSING
20010 L=12
20020 GOSUB 18000
20030 PRINT "WE ARE FINISHED!"
20040 PRINT "I HOPE YOU HAD A GOOD TIME!"
20050 GOSUB 18000
20060 END
```

TABLE OF VARIABLES

SA$
```
   1010   2160   2170   17020
```

L
```
   2010   2140   4010   4150   4180   4340
   4370   4470   4680   5010   5260   5370
   5600   5830   5860   6010   6190   6260
   6330   6390   6440   6500   6620   7010
   7040   7110   7180   7250   7350   7420
  11130  12010  12040  18010  20010
```

D
```
   2050   2190   7580   7630   7680  12060
  19010
```

SA
```
   4490   4500   4500   4510   4700   4710
   4710   4720   5390   5400   5400   5410
   5620   5630   5630   5640   5640   5650
   5650   5660   6280   6290   6290   6300
   6300   6310   6310   6320   6520   6530
   6530   6540   6540   6550   6550   6560
   7130   7140   7270   7280   7280   7290
   7290   7300   7300   7310   7440   7450
   7450   7460   7460   7470   7470   7480
```

V
```
   7150   7170   7540
```

DI
```
   7320   7340   7530
```

MA
```
   7490   7510   7550
```

I
```
  18010  18030  19010  19020
```

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   METRICS BY GARY ORWIG
1000 REM  INITIALIZATION
1010 REM  USE FULL SCREEN
```

```
1020 POKE 82,0
1030 CLS
2000 REM   INTRODUCTION
2010 L = 12
2020 GOSUB 18000
2030 PRINT "            METRICS"
2040 GOSUB 18000
2050 D = 1000
2060 GOSUB 19000
2070 GOSUB 18000
2080 PRINT "THIS IS A PROGRAM ABOUT THE METRIC"
2090 PRINT "SYSTEM."
2100 PRINT
2110 PRINT "WOULD YOU LIKE TO TAKE A QUIZ TO SEE"
2120 PRINT "IF YOU ALREADY KNOW ABOUT THE METRIC"
2130 PRINT "SYSTEM (YES OR NO)?"
2140 L = 6
2150 GOSUB 18000
2160 INPUT SA$
2170 IF SA$ = "YES" THEN 2220
2180 PRINT "LET'S LOOK AT THE METRIC SYSTEM!"
2190 D = 1000
2200 GOSUB 19000
2210 GOTO 3000
2220 GOSUB 7000
2230 GOTO 20000
3000 REM   GUIDING PROGRAM
3010 GOSUB 4000
3020 GOSUB 5000
3030 GOSUB 6000
3040 GOSUB 7000
3050 GOTO 20000
4000 REM   DISTANCE
4010 L = 24
4020 GOSUB 18000
4030 PRINT "THE BASIC UNIT OF LENGTH IN THE METRIC"
4040 PRINT "SYSTEM IS THE 'METER.'  AT FIRST THE"
4050 PRINT "METER WAS DEFINED AS ONE TEN MILLIONTH"
4060 PRINT "THE DISTANCE FROM THE EQUATOR TO THE"
4070 PRINT "NORTH POLE.  HOWEVER, IT SOON BECAME"
4080 PRINT "EVIDENT THAT THIS DISTANCE IS VERY HARD"
4090 PRINT "TO MEASURE EVERY TIME THE STANDARD"
4100 PRINT "NEEDED TO BE CHECKED!"
4110 PRINT
4120 PRINT "PRESENTLY THE METER IS DEFINED ON THE"
4130 PRINT "BASIS OF A VERY ACCURATELY MEASURED"
4140 PRINT "WAVELENGTH OF LIGHT."
4150 L = 6
4160 GOSUB 18000
4170 GOSUB 17000
4180 L = 24
4190 GOSUB 18000
4200 PRINT "THE METRIC UNITS OF LENGTH WHICH ARE"
4210 PRINT "COMMONLY USED ARE:"
4220 PRINT
4230 PRINT "    MILLIMETER"
4240 PRINT "    CENTIMETER"
```

```
4250 PRINT "      METER"
4260 PRINT "      KILOMETER"
4270 PRINT
4280 PRINT "THE MILLIMETER IS 1/1000 OF A METER"
4290 PRINT "                      1/10 OF A CENTIMETER"
4300 PRINT
4310 PRINT "THE CENTIMETER IS 1/100 OF A METER"
4320 PRINT
4330 PRINT "THE KILOMETER IS 1000 METERS."
4340 L = 6
4350 GOSUB 18000
4360 GOSUB 17000
4370 L = 24
4380 GOSUB 18000
4390 PRINT "LET'S TRY A COUPLE OF SIMPLE CONVERSION"
4400 PRINT "PROBLEMS."
4410 PRINT
4420 PRINT "25 MILLIMETERS EQUALS:"
4430 PRINT "      1.   2.5"
4440 PRINT "      2.    .25"
4450 PRINT "      3.  32."
4460 PRINT "            CENTIMETERS"
4470 L = 8
4480 GOSUB 18000
4490 INPUT SA
4500 IF SA = 2.5 THEN SA = 1
4510 ON SA GOTO 4520,4540,4570
4520 GOSUB 12000
4530 GOTO 4600
4540 PRINT "10 MILLIMETERS EQUAL 1 CENTIMETER."
4550 PRINT "25 MILLIMETERS EQUAL ? CENTIMETERS.";
4560 GOTO 4490
4570 GOSUB 11010
4580 PRINT
4590 GOTO 4410
4600 PRINT "HERE IS ANOTHER PROBLEM."
4610 PRINT
4620 PRINT ".52 KILOMETERS EQUALS:"
4630 PRINT
4640 PRINT "      1. 52 METERS
4650 PRINT "      2. 760 METERS
4660 PRINT "      3. 520 METERS
4670 PRINT
4680 L = 7
4690 GOSUB 18000
4700 INPUT SA
4710 IF SA = 520 THEN SA = 3
4720 ON SA GOTO 4730,4760,4790
4730 PRINT "1 KILOMETER EQUALS 1000 METERS"
4740 PRINT ".52 KILOMETERS EQUALS ? METERS";
4750 GOTO 4700
4760 GOSUB 11010
4770 PRINT "THINK ABOUT IT!"
4780 GOTO 4610
4790 GOSUB 12000
4800 RETURN
5000 REM  VOLUME
```

```
5010 L = 12
5020 GOSUB 18000
5030 PRINT "THE METRIC UNIT FOR VOLUME IS BASED"
5040 PRINT "UPON THE METRIC UNIT OF LENGTH."
5050 PRINT
5060 PRINT "IF A CUBE WERE CONSTRUCTED SO THAT IT"
5070 PRINT "WAS EXACTLY .1 METERS ON EACH SIDE,"
5080 PRINT "IT COULD HOLD ONE LITER OF MATERIAL."
5090 PRINT
5100 PRINT "THE LITER, THEN, IS THE BASIC METRIC"
5110 PRINT "UNIT FOR VOLUME.  THE LITER IS NOT TOO"
5120 PRINT "DIFFERENT IN SIZE FROM THE QUART."
5130 PRINT
5140 PRINT "IF A CUBE WERE FORMED EXACTLY ONE"
5150 PRINT "CENTIMETER ON A SIDE, WE WOULD CALL IT"
5160 PRINT "A 'CUBIC CENTIMETER.'  THIS VERY SMALL"
5170 PRINT "UNIT IS EXACTLY .001 LITERS, SO WE"
5180 PRINT "ALSO CALL IT A 'MILLILITER.'"
5190 PRINT
5200 PRINT "THE TERM 'CUBIC CENTIMETER' OR 'CC' AND"
5210 PRINT "THE TERM 'MILLILITER' OR 'ML' BOTH"
5220 PRINT "MEAN THE SAME AMOUNT OF VOLUME - "
5230 PRINT "ONE ONE THOUSANDTH OF A LITER."
5240 PRINT
5250 GOSUB 17000
5260 L = 12
5270 GOSUB 18000
5280 PRINT "HERE ARE A COUPLE OF QUESTIONS:"
5290 PRINT
5300 PRINT
5310 PRINT "HOW MANY CUBIC CENTIMETERS ARE IN A "
5320 PRINT "MILLITER?"
5330 PRINT
5340 PRINT "        1.   1"
5350 PRINT "        2.   2"
5360 PRINT "        3.  10"
5370 L = 9
5380 GOSUB 18000
5390 INPUT SA
5400 IF SA = 10 THEN SA = 3
5410 ON SA GOTO 5420,5450,5470
5420 GOSUB 12000
5430 PRINT "YOU ARE RIGHT!  THEY ARE THE SAME!"
5440 GOTO 5520
5450 GOSUB 11170
5460 GOTO 5290
5470 PRINT
5480 PRINT "YOU DID NOT READ VERY CLOSELY!"
5490 PRINT "THERE IS SOMETHING VERY 'UNIQUE'"
5500 PRINT "ABOUT THESE TWO UNITS!"
5510 GOTO 5290
5520 PRINT
5530 PRINT "WHAT IS THE VOLUME OF A BOX (IN LITERS)"
5540 PRINT "IF IT MEASURES .50 METERS BY .30 METERS"
5550 PRINT "BY .20 METERS?"
5560 PRINT
5570 PRINT "     1. 50 LITERS"
```

```
5580 PRINT "    2. 30 LITERS"
5590 PRINT "    3. 10 LITERS"
5600 L = 8
5610 GOSUB 18000
5620 INPUT SA
5630 IF SA = 50 THEN SA = 1
5640 IF SA = 30 THEN SA = 2
5650 IF SA = 10 THEN SA = 3
5660 ON SA GOTO 5690,5670,5690
5670 GOSUB 12000
5680 GOTO 5860
5690 PRINT
5700 PRINT
5710 PRINT "REMEMBER THAT A LITER IS DEFINED AS THE"
5720 PRINT "VOLUME OF A CUBE .10 METERS ON EACH"
5730 PRINT "SIDE.  ALTHOUGH THE TERM FOR .10 METER"
5740 PRINT "ISN'T USED VERY MUCH, IT IS CALLED A"
5750 PRINT "'DECIMETER.'  IF YOU CONVERT THE METER"
5760 PRINT "MEASUREMENTS TO DECIMETERS (.5 METERS"
5770 PRINT "EQUALS 5. DECIMETERS) AND MULTIPLY ALL"
5780 PRINT "THREE TOGETHER, YOU WILL END UP WITH"
5790 PRINT "THE VOLUME IN CUBIC DECIMETERS OR"
5800 PRINT "WHAT WE CALL LITERS!"
5810 PRINT
5820 GOSUB 17000
5830 L = 12
5840 GOSUB 18000
5850 GOTO 5520
5860 L = 12
5870 GOSUB 18000
5880 RETURN
6000 REM   MASS
6010 L = 12
6020 GOSUB 18000
6030 PRINT "THE METRIC UNIT FOR MASS IS THE 'GRAM.'"
6040 PRINT "ORIGINALLY THE GRAM WAS DEFINED AS THE"
6050 PRINT "MASS OF 1 CUBIC CENTIMETER OF WATER"
6060 PRINT "UNDER CONTROLLED CONDITIONS."
6070 PRINT "NOW THERE ARE MORE ACCURATE METHODS FOR"
6080 PRINT "DEFINING THE GRAM."
6090 PRINT
6100 PRINT "SINCE THE GRAM IS A SMALL UNIT OF"
6110 PRINT "MEASURE (A NICKEL HAS A MASS OF ABOUT"
6120 PRINT "5 GRAMS), A LARGER UNIT IS ALSO USED."
6130 PRINT "THE 'KILOGRAM' IS 1000 GRAMS."
6140 PRINT
6150 PRINT
6160 GOSUB 17000
6170 PRINT "HERE ARE A COUPLE OF QUESTIONS."
6180 PRINT
6190 L = 6
6200 GOSUB 18000
6210 PRINT "UNDER CONTROLLED CONDITIONS, WHAT WOULD"
6220 PRINT "BE THE MASS OF 1.0 LITER OF WATER?"
6230 PRINT "    1. 10 GRAMS"
6240 PRINT "    2. 100 GRAMS"
6250 PRINT "    3. 1000 GRAMS"
```

```
6260 L = 8
6270 GOSUB 18000
6280 INPUT SA
6290 IF SA = 10 THEN SA = 1
6300 IF SA = 100 THEN SA = 2
6310 IF SA = 1000 THEN SA = 3
6320 ON SA GOTO 6330,6330,6430
6330 L = 12
6340 GOSUB 18000
6350 PRINT "A LITER CONTAINS 1000 CUBIC CENTIMETERS."
6360 PRINT "SINCE A CUBIC CENTIMETER OF WATER HAS A"
6370 PRINT "MASS OF 1.0 GRAM, WHAT WOULD BE THE"
6380 PRINT "MASS OF 1000 CUBIC CENTIMETERS OF WATER?"
6390 L = 7
6400 GOSUB 18000
6410 GOSUB 17000
6420 GOTO 6190
6430 GOSUB 12000
6440 L = 12
6450 GOSUB 18000
6460 PRINT "HOW MANY GRAMS ARE IN .450 KILOGRAMS?"
6470 PRINT "       1. 45.0 "
6480 PRINT "       2. 450"
6490 PRINT "       3. 900"
6500 L = 9
6510 GOSUB 18000
6520 INPUT SA
6530 IF SA = 45 THEN SA = 1
6540 IF SA = 450 THEN SA = 2
6550 IF SA = 900 THEN SA = 3
6560 ON SA GOTO 6570,6640,6660
6570 GOSUB 11170
6580 PRINT
6590 PRINT "1.0 KILOGRAMS = 1000 GRAMS"
6600 PRINT ".450 KILOGRAMS = ? GRAMS"
6610 PRINT
6620 L = 6
6630 GOTO 6450
6640 GOSUB 12000
6650 GOTO 6680
6660 GOSUB 11010
6670 GOTO 6440
6680 RETURN
7000 REM  POST TEST
7010 L = 12
7020 GOSUB 18000
7030 PRINT "            QUIZ!"
7040 L = 6
7050 GOSUB 18000
7060 PRINT "WHAT IS THE METRIC UNIT FOR VOLUME?"
7070 PRINT
7080 PRINT "     1. METER"
7090 PRINT "     2. LITER"
7100 PRINT "     3. GRAM"
7110 L = 8
7120 GOSUB 18000
7130 INPUT SA
```

```
7140 ON SA GOTO 7150,7170,7150
7150 V = 0
7160 GOTO 7180
7170 V = 1
7180 L = 12
7190 GOSUB 18000
7200 PRINT "HOW MANY CENTIMETERS ARE IN 2.0 METERS?"
7210 PRINT
7220 PRINT "     1. 20"
7230 PRINT "     2. 200"
7240 PRINT "     3. 2000"
7250 L = 8
7260 GOSUB 18000
7270 INPUT SA
7280 IF SA = 20 THEN SA = 1
7290 IF SA = 200 THEN SA = 2
7300 IF SA = 2000 THEN SA = 3
7310 ON SA GOTO 7320,7340,7320
7320 DI = 0
7330 GOTO 7350
7340 DI = 1
7350 L = 12
7360 GOSUB 18000
7370 PRINT "2500 GRAMS WOULD BE HOW MANY KILOGRAMS?"
7380 PRINT
7390 PRINT "     1. 2.5"
7400 PRINT "     2. 25"
7410 PRINT "     3. 250"
7420 L = 8
7430 GOSUB 18000
7440 INPUT SA
7450 IF SA = 2.5 THEN SA = 1
7460 IF SA = 25 THEN SA = 2
7470 IF SA = 250 THEN SA = 3
7480 ON SA GOTO 7490,7510,7510
7490 MA = 1
7500 GOTO 7520
7510 MA = 0
7520 REM  SUMMARY
7530 IF DI = 0 THEN  GOTO 7570
7540 IF V = 0 THEN  GOTO 7620
7550 IF MA = 0 THEN  GOTO 7670
7560 RETURN
7570 PRINT "WE ARE GOING TO REVIEW DISTANCE."
7580 D = 1000
7590 GOSUB 19000
7600 GOSUB 4000
7610 GOTO 7540
7620 PRINT "WE ARE GOING TO REVIEW VOLUME."
7630 D = 1000
7640 GOSUB 19000
7650 GOSUB 5000
7660 GOTO 7550
7670 PRINT "WE ARE GOING TO REVIEW MASS."
7680 D = 1000
7690 GOSUB 19000
7700 GOSUB 6000
```

```
7710 GOTO 7560
11000 REM   CORRECTION ROUTINES
11010 PRINT
11020 PRINT
11030 PRINT "IN THE METRIC SYSTEM, CONVERSIONS ALWAYS"
11040 PRINT "ARE SOME POWER OF TEN.  FOR EXAMPLE,"
11050 PRINT "135. CENTIMETERS BECOMES 1.35 METERS."
11060 PRINT
11070 PRINT "NOTICE HOW THE SAME DIGITS ARE IN BOTH"
11080 PRINT "ANSWERS?  ONLY THE DECIMAL POINT"
11090 PRINT "(POWERS OF TEN) CHANGES."
11100 PRINT
11110 PRINT "IN A METRIC CONVERSION, ONLY THE DECIMAL"
11120 PRINT "CHANGES POSITION!"
11130 L = 8
11140 GOSUB 18000
11150 GOSUB 17000
11160 RETURN
11170 PRINT
11180 PRINT "IN THE METRIC SYSTEM, ANY UNIT WILL"
11190 PRINT "ALWAYS BE SOME POWER OF TEN BIGGER OR"
11200 PRINT "SMALLER THAN ANOTHER UNIT."
11210 PRINT
11220 PRINT "(.001, .01, .1, 1, 10, 100, 1000)"
11230 PRINT
11240 PRINT "BOTH UNITS MUST MEASURE THE SAME"
11250 PRINT "PHYSICAL DIMENSION, THOUGH."
11260 PRINT "(DISTANCE, VOLUME, MASS, ETC.)"
11270 PRINT
11280 GOSUB 17000
11290 RETURN
12000 REM  REWARDS
12010 L = 24
12020 GOSUB 18000
12030 PRINT "VERY GOOD!"
12040 L = 12
12050 GOSUB 18000
12060 D = 1000
12070 GOSUB 19000
12080 GOSUB 18000
12090 RETURN
17000 REM   PRESS RETURN
17010 PRINT "PRESS 'RETURN' TO CONTINUE."
17020 INPUT SA$
17030 RETURN
18000 REM   SCROLLING
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM   DELAY
19010 FOR I = 1 TO D
19020 NEXT I
19030 RETURN
20000 REM   CLOSING
20010 L = 12
```

```
20020 GOSUB 18000
20030 PRINT "WE ARE FINISHED!"
20040 PRINT "I HOPE YOU HAD A GOOD TIME!"
20050 GOSUB 18000
20060 END
```

TABLE OF VARIABLES

```
D - DELAY
2050 2190 7580 7630 7680 12060
19010

DI - SCORE ON DISTANCE
7320 7340 7530

I - COUNTER
18010 18030 19010 19020

L - LINES OF SCROLLING
2010 2140 4010 4150 4180 4340
4370 4470 4680 5010 5260 5370
5600 5830 5860 6010 6190 6260
6330 6390 6440 6500 6620 7010
7040 7110 7180 7250 7350 7420
11130 12010 12040 18010 20010

MA - SCORE ON MASS
7490 7510 7550

SA - STUDENT ANSWER
4490 4500 4500 4510 4700 4710
4710 4720 5390 5400 5400 5410
5620 5630 5630 5640 5640 5650
5650 5660 6280 6290 6290 6300
6300 6310 6310 6320 6520 6530
6530 6540 6540 6550 6550 6560
7130 7140 7270 7280 7280 7290
7290 7300 7300 7310 7440 7450
7450 7460 7460 7470 7470 7480

SA$ - STUDENT ANSWER
2160 2170 17020

V - SCORE ON VOLUME
7150 7170 7540

END OF VAR. LIST
```

SAMPLE RUN

```
THIS IS A PROGRAM ABOUT THE METRIC
SYSTEM.

WOULD YOU LIKE TO TAKE A QUIZ TO SEE
```

IF YOU ALREADY KNOW ABOUT THE METRIC
SYSTEM (YES OR NO)?

?YES

QUIZ!

WHAT IS THE METRIC UNIT FOR VOLUME?

        1. METER
        2. LITER
        3. GRAM

?2

HOW MANY CENTIMETERS ARE IN 2.0 METERS?

        1. 20
        2. 200
        3. 2000

?1

2500 GRAMS WOULD BE HOW MANY KILOGRAMS?

        1. 2.5
        2. 25
        3. 250

?1
WE ARE GOING TO REVIEW DISTANCE.

THE BASIC UNIT OF LENGTH IN THE METRIC
SYSTEM IS THE 'METER.' AT FIRST THE
METER WAS DEFINED AS ONE TEN MILLIONTH
THE DISTANCE FROM THE EQUATOR TO THE
NORTH POLE. HOWEVER, IT SOON BECAME
EVIDENT THAT THIS DISTANCE IS VERY HARD
TO MEASURE EVERY TIME THE STANDARD
NEEDED TO BE CHECKED!

PRESENTLY THE METER IS DEFINED ON THE
BASIS OF A VERY ACCURATELY MEASURED
WAVELENGTH OF LIGHT.

PRESS 'RETURN' TO CONTINUE.
?

THE METRIC UNITS OF LENGTH WHICH ARE
COMMONLY USED ARE:

    MILLIMETER
    CENTIMETER
    METER
    KILOMETER

THE MILLIMETER IS 1/1000 OF A METER
                  1/10 OF A CENTIMETER

THE CENTIMETER IS 1/100 OF A METER

THE KILOMETER IS 1000 METERS.

PRESS 'RETURN' TO CONTINUE.
?

LET'S TRY A COUPLE OF SIMPLE CONVERSION
PROBLEMS.

25 MILLIMETERS EQUALS:
        1.   2.5
        2.   .25
        3. 32.
                CENTIMETERS

?1

VERY GOOD!

HERE IS ANOTHER PROBLEM.

.52 KILOMETERS EQUALS:

        1. 52 METERS
        2. 760 METERS
        3. 520 METERS

?3

VERY GOOD!

WE ARE FINISHED!
I HOPE YOU HAD A GOOD TIME!

Story Writer
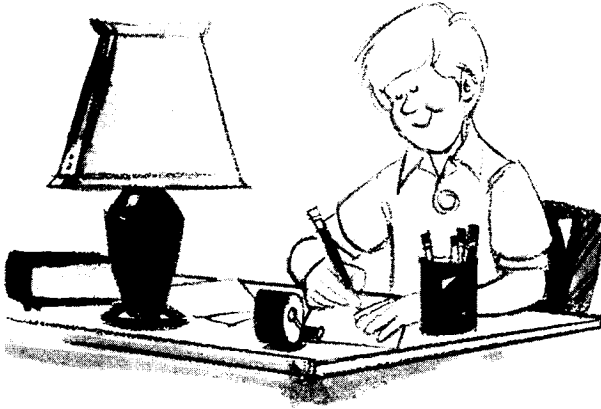
PROGRAM DESCRIPTION

This program is an instructional game on nouns, verbs, adjectives, and adverbs as well as sentence structuring. The computer gives you an initial quiz (pre-test) on nouns, verbs, adjectives, and adverbs. If you get all of the answers correct, the computer asks you to pick any noun, verb, adjective, and adverb and it will write sentences or stories from the words that you selected. If you do not receive a perfect score on the initial quiz, the computer will instruct you on nouns, verbs, adjectives, and adverbs. Some of the sentences or stories can be quite amusing, depending on the words selected.

PROGRAM NOTES

This program should give you ideas on how to turn your computer into an author. Collections of nouns, verbs, adjectives, and adverbs can even be combined with no filler (like the New Year's resolutions) to produce fundamental (although somewhat obscure) sentences. Try this order: adjective, noun, verb, noun, adverb. The result would be something like: "FAT CAT CHEW TREE SLOWLY." For activities like this you might want to enter larger lists of words in each class and draw from them at random.

PROGRAM LISTING: BASIC

```
100 REM STORY WRITER BY GARY ORWIG
1000 REM INITIALIZATION
1010 DIM AV$(15),J1$(15),J2$(15),J3$(15),N1$(15),N2$(15),N3$
(15),N4$(15),N5$(15),N6$(15),N7$(15)
1020 DIM NA$(30),SA$(5),V1$(15)
1030 REM USE FULL SCREEN
1040 POKE 82,0
1050 PRINT
2000 REM INTRODUCTION
2010 L=12
2020 GOSUB 18000
2030 PRINT "                    STORY WRITER"
2040 L=12
2050 GOSUB 18000
2060 D=200
2070 GOSUB 19000
2080 GOSUB 18000
2090 PRINT "WHAT IS YOUR NAME?"
2100 GOSUB 18000
2110 INPUT NA$
2120 GOSUB 18000
2130 PRINT "I'M HAPPY TO MEET YOU, ";NA$
2140 GOSUB 18000
2150 D=200
2160 GOSUB 19000
2170 PRINT "THIS IS A PROGRAM WHICH WILL WRITE A"
2180 PRINT "STORY FOR YOU!"
2190 PRINT
2200 PRINT "ALL YOU HAVE TO DO IS PROVIDE ME WITH"
2210 PRINT "A FEW WORDS!"
2220 PRINT
2230 PRINT "BEFORE WE GO VERY FAR, I NEED TO CHECK"
2240 PRINT "TO SEE IF YOU KNOW WHAT A FEW LANGUAGE"
2250 PRINT "TERMS MEAN."
2260 PRINT
2270 L=6
2280 GOSUB 18000
2290 GOSUB 17000
2300 L=12
2310 GOSUB 18000
2320 PRINT "WHICH OF THE FOLLOWING WORDS IS A NOUN?"
2330 GOSUB 16000
2340 IF SA<>3 THEN 2550
2350 PRINT "VERY GOOD!"
2360 PRINT "WHICH OF THE FOLLOWING WORDS IS A VERB?"
2370 GOSUB 16000
2380 IF SA<>4 THEN 2640
2390 PRINT "GREAT!"
2400 PRINT "WHICH OF THE FOLLOWING WORDS IS"
2410 PRINT "AN ADJECTIVE?"
2420 GOSUB 16000
2430 IF SA<>2 THEN 2740
2440 PRINT "EXCELLENT!"
2450 PRINT "WHICH OF THE FOLLOWING WORDS IS"
```

```
2460 PRINT "AN ADVERB?"
2470 GOSUB 16000
2480 IF SA<>1 THEN 2810
2490 PRINT "VERY GOOD!"
2500 PRINT
2510 PRINT "I THINK WE ARE READY TO GO AHEAD NOW!"
2520 PRINT
2530 GOSUB 17000
2540 GOTO 3000
2550 REM NOUN
2560 PRINT "A NOUN IS THE NAME OF A PERSON, PLACE,"
2570 PRINT "OR THING."
2580 PRINT
2590 PRINT "SIDEWALK, UMBRELLA, MAN, FLORIDA, AND"
2600 PRINT "FOOT ARE ALL NOUNS!"
2610 PRINT "NOUNS CAN BE EITHER SINGULAR"
2620 PRINT "(FOOT, MOUSE) OR PLURAL (FEET, MICE)."
2630 GOTO 2320
2640 REM VERB
2650 PRINT "A VERB IS ANY WORD WHICH EXPRESS AN"
2660 PRINT "ACTION."
2670 PRINT "YELL, RUN, JUMP, THINK, HIT, KICK,"
2680 PRINT "AND TALK ARE ALL VERBS."
2690 PRINT "A VERB CAN HAVE SEVERAL FORMS - -"
2700 PRINT "PRESENT, PAST, PAST PERFECT, ETC."
2710 PRINT "WE WILL ONLY WORK WITH PRESENT AND PAST"
2720 PRINT "TENSES (SWIM AND SWAM)."
2730 GOTO 2360
2740 REM ADJECTIVE
2750 PRINT "AN ADJECTIVE IS A WORD DESCRIBES"
2760 PRINT "SOMETHING OR SOMEBODY (A NOUN)."
2770 PRINT "SWEET, JUMPY, MODEST, ROUGH, YELLOW,"
2780 PRINT "AND STUPID ARE ALL ADJECTIVES."
2790 PRINT
2800 GOTO 2400
2810 REM ADVERB
2820 PRINT "AN ADVERB IS A WORD WHICH TELLS HOW"
2830 PRINT "SOMETHING IS DONE.  IT FREQUENTLY ENDS"
2840 PRINT "IN '-LY'."
2850 PRINT "QUICKLY, SLOWLY, MODESTLY, QUIETLY,"
2860 PRINT "AND CAREFULLY ARE ALL ADVERBS."
2870 PRINT
2880 GOTO 2450
3000 REM COLLECT WORDS
3010 L=12
3020 GOSUB 18000
3030 PRINT "FIRST I WILL NEED SOME NOUNS."
3040 PRINT "THINK OF SEVEN NOUNS (ALL SINGULAR)"
3050 PRINT "AND TYPE THEM IN ONE AT A TIME."
3060 PRINT
3070 PRINT
3080 PRINT "NOUN #1";
3090 INPUT N1$
3100 PRINT "NOUN #2";
3110 INPUT N2$
3120 PRINT "NOUN #3";
```

```
3130 INPUT N3$
3140 PRINT "NOUN #4";
3150 INPUT N4$
3160 PRINT "NOUN #5";
3170 INPUT N5$
3180 PRINT "NOUN #6";
3190 INPUT N6$
3200 PRINT "NOUN #7";
3210 INPUT N7$
3220 GOSUB 18000
3230 PRINT "GREAT! NOW I WILL NEED JUST ONE VERB."
3240 PRINT
3250 PRINT
3260 PRINT "VERB #1";
3270 INPUT V1$
3280 PRINT "NOW HOW ABOUT ONE ADJECTIVE?"
3290 PRINT
3300 PRINT
3310 PRINT "ADJECTIVE #1";
3320 INPUT J1$
3330 PRINT "NOW I NEED TWO NUMBERS."
3340 PRINT
3350 PRINT
3360 PRINT "NUMBER #1 (BETWEEN 2 AND 12)";
3370 INPUT J2$
3380 PRINT "NUMBER #2 (BETWEEN 2 AND 12)";
3390 INPUT J3$
3400 PRINT
3410 PRINT
3420 PRINT "I'M ALMOST DONE!  NOW ALL I NEED IS"
3430 PRINT "ONE ADVERB!"
3440 PRINT "ADVERB #1";
3450 INPUT AV$
4000 REM STORY
4010 L=12
4020 GOSUB 18000
4030 PRINT "     ";NA$;"'S NEW YEAR'S RESOLUTIONS"
4040 GOSUB 18000
4050 GOSUB 17000
4060 GOSUB 18000
4070 PRINT "I, ";NA$;", WILL STOP EATING TOO MUCH"
4080 PRINT N1$;"."
4090 GOSUB 18000
4100 GOSUB 17000
4110 GOSUB 18000
4120 PRINT "I WILL WATCH ONLY ";J1$;" TELEVISION"
4130 PRINT "SHOWS."
4140 GOSUB 18000
4150 GOSUB 17000
4160 GOSUB 18000
4170 PRINT "I WILL ";V1$;" EVERY DAY FOR "
4180 PRINT J2$;" HOURS."
4190 GOSUB 18000
4200 GOSUB 17000
4210 GOSUB 18000
4220 PRINT "I WILL MAKE MY ";N2$;" AND CLEAN"
```

```
4230 PRINT "MY ";N3$;" EVERY DAY."
4240 GOSUB 18000
4250 GOSUB 17000
4260 GOSUB 18000
4270 PRINT "I WILL TALK ";AV$;" WHILE I EAT MY"
4280 PRINT N4$;"."
4290 GOSUB 18000
4300 GOSUB 17000
4310 GOSUB 18000
4320 PRINT "I WILL GO TO BED AT ";J3$;" O'CLOCK."
4330 GOSUB 18000
4340 GOSUB 17000
4350 GOSUB 18000
4360 PRINT "I WILL TAKE GOOD CARE OF MY PET ";N5$;"."
4370 GOSUB 18000
4380 GOSUB 17000
4390 GOSUB 18000
4400 PRINT "I WILL NOT PUT ANY ";N6$;" IN MY"
4410 PRINT "MOTHER'S ";N7$;"."
4420 GOSUB 18000
4430 GOSUB 17000
4440 GOSUB 18000
4450 PRINT "I HOPE YOU CAN STICK TO YOUR"
4460 PRINT "RESOLUTIONS, ";NA$;"!"
4470 PRINT
4480 PRINT "BYE FOR NOW!"
4490 GOSUB 18000
4500 END
16000 REM QUIZ FRAME
16010 PRINT
16020 PRINT "TYPE IN 1,2,3 OR 4."
16030 PRINT
16040 PRINT "    1. SWIFTLY"
16050 PRINT "    2. GENTLE"
16060 PRINT "    3. TREE"
16070 PRINT "    4. JUMP"
16080 PRINT
16090 L=6
16100 GOSUB 18000
16110 INPUT SA
16120 RETURN
17000 REM WAIT FOR PRESS RETURN
17010 PRINT "PRESS 'RETURN' TO CONTINUE."
17020 INPUT SA$
17030 RETURN
18000 REM SCROLLING
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM DELAY
19010 FOR I=1 TO D
19020 NEXT I
19030 RETURN
```

TABLE OF VARIABLES

AV$
   1010   3450   4270

J1$
   1010   3320   4120

J2$
   1010   3370   4180

J3$
   1010   3390   4320

N1$
   1010   3090   4080

N2$
   1010   3110   4220

N3$
   1010   3130   4230

N4$
   1010   3150   4280

N5$
   1010   3170   4360

N6$
   1010   3190   4400

N7$
   1010   3210   4410

NA$
   1020   2110   2130   4030   4070   4460

SA$
   1020   17020

V1$
   1020   3270   4170

L
   2010   2040   2270   2300   3010   4010
   16090 18010

D
   2060   2150   19010

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   STORY WRITER BY GARY ORWIG
1000 REM  INITIALIZATION
1010 REM  USE FULL SCREEN
1020 POKE 82,0
1030 CLS
2000 REM   INTRODUCTION
2010 L = 12
2020 GOSUB 18000
2030 PRINT "                    STORY WRITER"
2040 L = 12
2050 GOSUB 18000
2060 D = 1000
2070 GOSUB 19000
2080 GOSUB 18000
2090 PRINT "WHAT IS YOUR NAME?"
2100 GOSUB 18000
2110 INPUT NA$
2120 GOSUB 18000
2130 PRINT "I'M HAPPY TO MEET YOU, ";NA$
2140 GOSUB 18000
2150 D = 1500
2160 GOSUB 19000
2170 PRINT "THIS IS A PROGRAM WHICH WILL WRITE A"
2180 PRINT "STORY FOR YOU!"
2190 PRINT
2200 PRINT "ALL YOU HAVE TO DO IS PROVIDE ME WITH"
2210 PRINT "A FEW WORDS!"
2220 PRINT
2230 PRINT "BEFORE WE GO VERY FAR, I NEED TO CHECK"
2240 PRINT "TO SEE IF YOU KNOW WHAT A FEW LANGUAGE"
2250 PRINT "TERMS MEAN."
2260 PRINT
2270 L = 6
2280 GOSUB 18000
2290 GOSUB 17000
2300 L = 12
2310 GOSUB 18000
2320 PRINT "WHICH OF THE FOLLOWING WORDS IS A NOUN?"
2330 GOSUB 16000
2340 IF SA <  > 3 THEN 2550
2350 PRINT "VERY GOOD!"
2360 PRINT "WHICH OF THE FOLLOWING WORDS IS A VERB?"
2370 GOSUB 16000
2380 IF SA <  > 4 THEN 2640
2390 PRINT "GREAT!"
2400 PRINT "WHICH OF THE FOLLOWING WORDS IS"
2410 PRINT "AN ADJECTIVE?"
```

```
2420 GOSUB 16000
2430 IF SA <  > 2 THEN 2740
2440 PRINT "EXCELLENT!"
2450 PRINT "WHICH OF THE FOLLOWING WORDS IS"
2460 PRINT "AN ADVERB?"
2470 GOSUB 16000
2480 IF SA <  > 1 THEN 2810
2490 PRINT "VERY GOOD!"
2500 PRINT
2510 PRINT "I THINK WE ARE READY TO GO AHEAD NOW!"
2520 PRINT
2530 GOSUB 17000
2540 GOTO 3000
2550 REM  NOUN
2560 PRINT "A NOUN IS THE NAME OF A PERSON, PLACE,"
2570 PRINT "OR THING."
2580 PRINT
2590 PRINT "SIDEWALK, UMBRELLA, MAN, FLORIDA, AND"
2600 PRINT "FOOT ARE ALL NOUNS!"
2610 PRINT "NOUNS CAN BE EITHER SINGULAR"
2620 PRINT "(FOOT, MOUSE) OR PLURAL (FEET, MICE)."
2630 GOTO 2320
2640 REM  VERB
2650 PRINT "A VERB IS ANY WORD WHICH EXPRESS AN"
2660 PRINT "ACTION."
2670 PRINT "YELL, RUN, JUMP, THINK, HIT, KICK,"
2680 PRINT "AND TALK ARE ALL VERBS."
2690 PRINT "A VERB CAN HAVE SEVERAL FORMS - -"
2700 PRINT "PRESENT, PAST, PAST PERFECT, ETC."
2710 PRINT "WE WILL ONLY WORK WITH PRESENT AND PAST"
2720 PRINT "TENSES (SWIM AND SWAM)."
2730 GOTO 2360
2740 REM  ADJECTIVE
2750 PRINT "AN ADJECTIVE IS A WORD DESCRIBES"
2760 PRINT "SOMETHING OR SOMEBODY (A NOUN)."
2770 PRINT "SWEET, JUMPY, MODEST, ROUGH, YELLOW,"
2780 PRINT "AND STUPID ARE ALL ADJECTIVES."
2790 PRINT
2800 GOTO 2400
2810 REM  ADVERB
2820 PRINT "AN ADVERB IS A WORD WHICH TELLS HOW"
2830 PRINT "SOMETHING IS DONE.  IT FREQUENTLY ENDS"
2840 PRINT "IN '-LY'."
2850 PRINT "QUICKLY, SLOWLY, MODESTLY, QUIETLY,"
2860 PRINT "AND CAREFULLY ARE ALL ADVERBS."
2870 PRINT
2880 GOTO 2450
3000 REM  COLLECT WORDS
3010 L = 12
3020 GOSUB 18000
3030 PRINT "FIRST I WILL NEED SOME NOUNS."
3040 PRINT "THINK OF SEVEN NOUNS (ALL SINGULAR)"
3050 PRINT "AND TYPE THEM IN ONE AT A TIME."
3060 PRINT
3070 PRINT
3080 PRINT "NOUN #1";
```

```
3090 INPUT N1$
3100 PRINT "NOUN #2";
3110 INPUT N2$
3120 PRINT "NOUN #3";
3130 INPUT N3$
3140 PRINT "NOUN #4";
3150 INPUT N4$
3160 PRINT "NOUN #5";
3170 INPUT N5$
3180 PRINT "NOUN #6";
3190 INPUT N6$
3200 PRINT "NOUN #7";
3210 INPUT N7$
3220 GOSUB 18000
3230 PRINT "GREAT! NOW I WILL NEED JUST ONE VERB."
3240 PRINT
3250 PRINT
3260 PRINT "VERB #1";
3270 INPUT V1$
3280 PRINT "NOW HOW ABOUT ONE ADJECTIVE?"
3290 PRINT
3300 PRINT
3310 PRINT "ADJECTIVE #1";
3320 INPUT J1$
3330 PRINT "NOW I NEED TWO NUMBERS."
3340 PRINT
3350 PRINT
3360 PRINT "NUMBER #1 (BETWEEN 2 AND 12)";
3370 INPUT J2$
3380 PRINT "NUMBER #2 (BETWEEN 2 AND 12)";
3390 INPUT J3$
3400 PRINT
3410 PRINT
3420 PRINT "I'M ALMOST DONE!  NOW ALL I NEED IS"
3430 PRINT "ONE ADVERB!"
3440 PRINT "ADVERB #1";
3450 INPUT AV$
4000 REM  STORY
4010 L = 12
4020 GOSUB 18000
4030 PRINT "    ";NA$;"'S NEW YEAR'S RESOLUTIONS"
4040 GOSUB 18000
4050 GOSUB 17000
4060 GOSUB 18000
4070 PRINT "I, ";NA$;", WILL STOP EATING TOO MUCH"
4080 PRINT N1$;"."
4090 GOSUB 18000
4100 GOSUB 17000
4110 GOSUB 18000
4120 PRINT "I WILL WATCH ONLY ";J1$;" TELEVISION"
4130 PRINT "SHOWS."
4140 GOSUB 18000
4150 GOSUB 17000
4160 GOSUB 18000
4170 PRINT "I WILL ";V1$;" EVERY DAY FOR "
4180 PRINT J2$;" HOURS."
4190 GOSUB 18000
```

```
4200 GOSUB 17000
4210 GOSUB 18000
4220 PRINT "I WILL MAKE MY ";N2$;" AND CLEAN"
4230 PRINT "MY ";N3$;" EVERY DAY."
4240 GOSUB 18000
4250 GOSUB 17000
4260 GOSUB 18000
4270 PRINT "I WILL TALK ";AV$;" WHILE I EAT MY"
4280 PRINT N4$;"."
4290 GOSUB 18000
4300 GOSUB 17000
4310 GOSUB 18000
4320 PRINT "I WILL GO TO BED AT ";J3$;" O'CLOCK."
4330 GOSUB 18000
4340 GOSUB 17000
4350 GOSUB 18000
4360 PRINT "I WILL TAKE GOOD CARE OF MY PET ";N5$;"."
4370 GOSUB 18000
4380 GOSUB 17000
4390 GOSUB 18000
4400 PRINT "I WILL NOT PUT ANY ";N6$;" IN MY"
4410 PRINT "MOTHER'S ";N7$;"."
4420 GOSUB 18000
4430 GOSUB 17000
4440 GOSUB 18000
4450 PRINT "I HOPE YOU CAN STICK TO YOUR"
4460 PRINT "RESOLUTIONS, ";NA$;"!"
4470 PRINT
4480 PRINT "BYE FOR NOW!"
4490 GOSUB 18000
4500 END
16000 REM  QUIZ FRAME
16010 PRINT
16020 PRINT "TYPE IN 1,2,3 OR 4."
16030 PRINT
16040 PRINT "    1. SWIFTLY"
16050 PRINT "    2. GENTLE"
16060 PRINT "    3. TREE"
16070 PRINT "    4. JUMP"
16080 PRINT
16090 L = 6
16100 GOSUB 18000
16110 INPUT SA
16120 RETURN
17000 REM  WAIT FOR PRESS RETURN
17010 PRINT "PRESS 'RETURN' TO CONTINUE."
17020 INPUT SA$
17030 RETURN
18000 REM  SCROLLING
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM  DELAY
19010 FOR I = 1 TO D
19020 NEXT I
19030 RETURN
```

TABLE OF VARIABLES

AV$ — ADVERB
3450 4270

D — DELAY
2060 2150 19010

I — COUNTER
18010 18030 19010 19020

J1$ — ADJ. 1
3320 4120

J2$ — ADJ. 2
3370 4180

J3$ — ADJ. 3
3390 4320

L — LINES OF SCROLLING
2010 2040 2270 2300 3010 4010
16090 18010

N1$ — NOUN 1
3090 4080

N2$ — NOUN 2
3110 4220

N3$ — NOUN 3
3130 4230

N4$ — NOUN 4
3150 4280

N5$ — NOUN 5
3170 4360

N6$ — NOUN 6
3190 4400

N7$ — NOUN 7
3210 4410

NA$ — NAME
2110 2130 4030 4070 4460

SA — STUDENT ANSWER
2340 2380 2430 2480 16110

SA$ — STUDENT ANSWER
17020

V1$ — VERB 1
3270 4170

END OF VAR. LIST

SAMPLE RUN

WHAT IS YOUR NAME?

?LAURIE

I'M HAPPY TO MEET YOU, LAURIE

THIS IS A PROGRAM WHICH WILL WRITE A
STORY FOR YOU!

ALL YOU HAVE TO DO IS PROVIDE ME WITH
A FEW WORDS!

BEFORE WE GO VERY FAR, I NEED TO CHECK
TO SEE IF YOU KNOW WHAT A FEW LANGUAGE
TERMS MEAN.

PRESS 'RETURN' TO CONTINUE.
?

WHICH OF THE FOLLOWING WORDS IS A NOUN?

TYPE IN 1,2,3 OR 4.

        1. SWIFTLY
        2. GENTLE
        3. TREE
        4. JUMP

?4
A NOUN IS THE NAME OF A PERSON, PLACE,
OR THING.

SIDEWALK, UMBRELLA, MAN, FLORIDA, AND
FOOT ARE ALL NOUNS!
NOUNS CAN BE EITHER SINGULAR
(FOOT, MOUSE) OR PLURAL (FEET, MICE).
WHICH OF THE FOLLOWING WORDS IS A NOUN?

TYPE IN 1,2,3 OR 4.

        1. SWIFTLY
        2. GENTLE
        3. TREE
        4. JUMP

?3

VERY GOOD!
WHICH OF THE FOLLOWING WORDS IS A VERB?

TYPE IN 1,2,3 OR 4.

        1. SWIFTLY
        2. GENTLE
        3. TREE
        4. JUMP

?4
GREAT!
WHICH OF THE FOLLOWING WORDS IS
AN ADJECTIVE?

TYPE IN 1,2,3 OR 4.

        1. SWIFTLY
        2. GENTLE
        3. TREE
        4. JUMP

?2
EXCELLENT!
WHICH OF THE FOLLOWING WORDS IS
AN ADVERB?

TYPE IN 1,2,3 OR 4.

        1. SWIFTLY
        2. GENTLE
        3. TREE
        4. JUMP

?1
VERY GOOD!

I THINK WE ARE READY TO GO AHEAD NOW!

PRESS 'RETURN' TO CONTINUE.
?

FIRST I WILL NEED SOME NOUNS.
THINK OF SEVEN NOUNS (ALL SINGULAR)
AND TYPE THEM IN ONE AT A TIME.

    NOUN #1?CAT
    NOUN #2?DOG
    NOUN #3?HOUSE
NOUN #4?TREE

```
NOUN #5?HORSE
NOUN #6?CHICKEN
NOUN #7?CAR


GREAT! NOW I WILL NEED JUST ONE VERB.


VERB #1?RUN
NOW HOW ABOUT ONE ADJECTIVE?


ADJECTIVE #1?HAPPY
NOW I NEED TWO NUMBERS.


NUMBER #1 (BETWEEN 2 AND 12)?5
NUMBER #2 (BETWEEN 2 AND 12)?7


I'M ALMOST DONE!  NOW ALL I NEED IS
ONE ADVERB!
ADVERB #1?QUICKLY


      LAURIE'S NEW YEAR'S RESOLUTIONS


PRESS 'RETURN' TO CONTINUE.
?


I, LAURIE, WILL STOP EATING TOO MUCH
CAT.


PRESS 'RETURN' TO CONTINUE.
?


I WILL WATCH ONLY HAPPY TELEVISION
SHOWS.


PRESS 'RETURN' TO CONTINUE.
?


I WILL RUN EVERY DAY FOR
5 HOURS.


PRESS 'RETURN' TO CONTINUE.
?


I WILL MAKE MY DOG AND CLEAN
MY HOUSE EVERY DAY.
```

PRESS 'RETURN' TO CONTINUE.
?

I WILL TALK QUICKLY WHILE I EAT MY
TREE.

PRESS 'RETURN' TO CONTINUE.
?

I WILL GO TO BED AT 7 O'CLOCK.

PRESS 'RETURN' TO CONTINUE.
?

I WILL TAKE GOOD CARE OF MY PET HORSE.

PRESS 'RETURN' TO CONTINUE.
?

I WILL NOT PUT ANY CHICKEN IN MY
MOTHER'S CAR.


PRESS 'RETURN' TO CONTINUE.
?

I HOPE YOU CAN STICK TO YOUR
RESOLUTIONS, LAURIE!

BYE FOR NOW!

SIMULATION PROGRAMS

Simulation programming is a form of instruction that puts the learner in a *real-life* situation. It allows the learner to use decisionmaking skills to alter the situation and then to witness the outcome created by the decisions. Science and engineering, as well as the aerospace industry, use simulations for structural designs and for training of personnel. A great deal of enthusiasm or motivation from the learner is one good aspect of the use of simulation CAI. The six program listings and sample runs were chosen to demonstrate the use of simulation programming to teach the learner to adjust to a variety of real-life situations involving such subjects as retailing, science, ballistics, and financing.

Acceleration
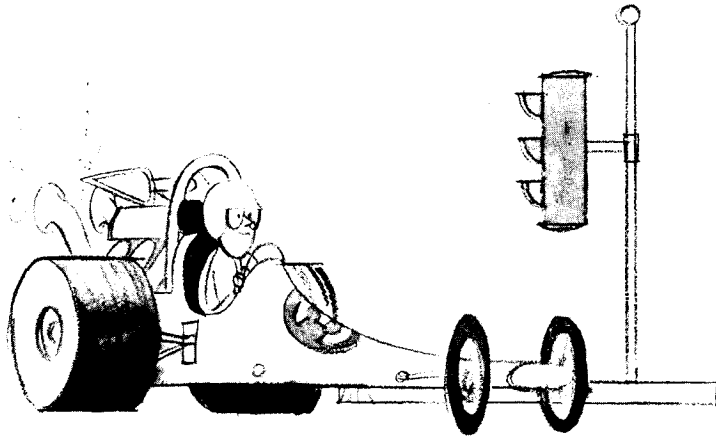
PROGRAM DESCRIPTION

This is a program that will help you to understand better what acceleration is all about. You will need to know about the relationships between time, distance, velocity, and acceleration from a science book and practice with the program TIME, DISTANCE, AND VELOCITY before you attempt to operate this simulation program.

In this program, you select any units you want to use to represent time and distance. Observe the results carefully, since the answers will be in the same units that you selected. There are two limitations on the units you input into the computer for time and distance. Do not type in "0" for a value since some of the equations would make the computer divide by "0" and, as you know, the equations would not operate. Also, the computer does not check to see if you have accelerated beyond the speed of light, which is not a probable occurrence in the real world.

PROGRAM NOTES

1. Consider adding a "zero filter" to eliminate potential problems with division by zero.

2. How could you allow for relativity and the limitation of the speed of light? Would it be possible to check an answer to see if it approaches or exceeds the limits?

```
100 REM ACCELERATION BY GARY ORWIG
1000 REM INITIALIZATION
1010 DIM D$(15),NA$(30),S$(15),T$(15)
1020 REM USE FULL SCREEN
1030 POKE 82,0
1040 PRINT
2000 REM INTRODUCTION
2010 L=24
2020 GOSUB 18000
2030 FOR J=0 TO 300 STEP 8
2040 DE=(301-J)/5
2050 GOSUB 19000
2060 PRINT ">>>>>>>>>>ACCELERATION>>>>>>>>>>>>>>>>>>>>>>>>>"
;
2070 NEXT J
2080 FOR I=1 TO 10
2090 PRINT ">>>>>>>>>>ACCELERATION>>>>>>>>>>>>>>>>>>>>>>>>>"
;
2100 NEXT I
2110 DE=200
2120 GOSUB 19000
2130 L=24
2140 GOSUB 18000
2150 PRINT "IT'S NICE TO SEE YOU!"
2160 PRINT "WHAT IS YOUR NAME?";
2170 L=12
2180 GOSUB 18000
2190 INPUT NA$
2200 GOSUB 18000
2210 PRINT
2220 PRINT
2230 PRINT "I HOPE YOU HAVE A GOOD TIME, ";NA$;"."
2240 D=1500
2250 GOSUB 19000
2260 L=24
2270 GOSUB 18000
2280 PRINT "THIS IS A PROGRAM WHICH WILL HELP"
2290 PRINT "YOU TO BETTER UNDERSTAND ACCELERATION."
2300 PRINT
2310 PRINT "YOU SHOULD FIRST READ ABOUT TIME,"
2320 PRINT "DISTANCE, VELOCITY, AND ACCELERATION"
2330 PRINT "IN A SCIENCE BOOK TO GET A BASIC "
2340 PRINT "UNDERSTANDING OF THEM."
2350 PRINT
2360 PRINT "IN THIS PROGRAM, YOU CAN PICK ANY UNITS"
2370 PRINT "YOU WANT TO USE TO REPRESENT TIME AND"
2380 PRINT "DISTANCE.  THE ANSWERS WILL BE IN THOSE"
2390 PRINT "SAME UNITS."
2400 PRINT
2410 PRINT "THERE ARE TWO LIMITATIONS..............."
2420 PRINT "DON'T TYPE IN '0' FOR A VALUE!"
2430 PRINT "(SOME OF MY EQUATIONS WOULD MAKE ME TRY"
2440 PRINT "TO DIVIDE BY 0!)"
2450 PRINT "ALSO, I DON'T CHECK TO SEE IF YOU HAVE"
2460 PRINT "ACCELERATED BEYOND THE SPEED OF LIGHT!"
```

```
2470 PRINT "(SOMETHING HARD TO DO IN REAL LIFE!)"
2480 PRINT
2490 PRINT
2500 PRINT "PRESS 'RETURN' TO CONTINUE."
2510 INPUT S$
2520 L=24
2530 GOSUB 18000
3000 REM SET UNITS
3010 PRINT "WHAT UNIT DO YOU WANT TO USE FOR TIME?"
3020 PRINT "(SECONDS, MINUTES, HOURS, ETC.)"
3030 INPUT T$
3040 PRINT
3050 PRINT "WHAT UNIT DO YOU WANT FOR DISTANCE?"
3060 PRINT "(METERS, KILOMETERS, MILES, ETC.)"
3070 INPUT D$
3080 PRINT
3090 PRINT "TIME WILL BE IN ";T$;"."
3100 PRINT
3110 PRINT "DISTANCE WILL BE IN ";D$;"."
3120 PRINT
3130 PRINT "VELOCITY WILL BE IN"
3140 PRINT D$;" PER ";T$;"."
3150 PRINT
3160 PRINT "ACCELERATION WILL BE IN"
3170 PRINT D$;" PER ";T$;" PER ";T$;"."
3180 PRINT
3190 PRINT
3200 PRINT "PRESS 'RETURN' TO CONTINUE."
3210 INPUT S$
3220 L=24
3230 GOSUB 18000
4000 REM MAIN PROGRAM
4010 PRINT "SELECT ONE AND ENTER THE NUMBER."
4020 PRINT
4030 PRINT
4040 PRINT "        1. GIVEN A : T, FIND V : D"
4050 PRINT
4060 PRINT "        2. GIVEN A : D, FIND V : T"
4070 PRINT
4080 PRINT "        3. GIVEN A : V, FIND D : T"
4090 PRINT
4100 PRINT "        4. GIVEN V : D, FIND A : T"
4110 PRINT
4120 PRINT "        5. GIVEN V : T, FIND A : D"
4130 PRINT
4140 PRINT "        6. GIVEN D : T, FIND A : V"
4150 PRINT
4160 INPUT SA
4170 IF SA<1 OR SA>6 THEN 4010
4180 L=24
4190 GOSUB 18000
4200 ON SA GOTO 4210,4270,4330,4390,4450,4510
4210 PRINT "ENTER A"
4220 INPUT A
4230 PRINT "ENTER T"
4240 INPUT T
```

```
4250 GOSUB 6010
4260 GOTO 5000
4270 PRINT "ENTER A"
4280 INPUT A
4290 PRINT "ENTER D"
4300 INPUT D
4310 GOSUB 6050
4320 GOTO 5000
4330 PRINT "ENTER A"
4340 INPUT A
4350 PRINT "ENTER V"
4360 INPUT V
4370 GOSUB 6090
4380 GOTO 5000
4390 PRINT "ENTER V"
4400 INPUT V
4410 PRINT "ENTER D"
4420 INPUT D
4430 GOSUB 6130
4440 GOTO 5000
4450 PRINT "ENTER V"
4460 INPUT V
4470 PRINT "ENTER T"
4480 INPUT T
4490 GOSUB 6170
4500 GOTO 5000
4510 PRINT "ENTER D"
4520 INPUT D
4530 PRINT "ENTER T"
4540 INPUT T
4550 GOSUB 6210
4560 GOTO 5000
5000 REM PRINT ANSWERS
5010 L=6
5020 GOSUB 18000
5030 PRINT "ACCELERATION:  ";A;" ";D$;" PER ";T$;" PER ";T$
5040 PRINT
5050 PRINT "VELOCITY:      ";V;" ";D$;" PER ";T$
5060 PRINT
5070 PRINT "DISTANCE:      ";D;" ";D$
5080 PRINT
5090 PRINT "TIME:          ";T;" ";T$
5100 PRINT
5110 PRINT
5120 PRINT "ENTER MORE VALUES (YES OR NO)"
5130 INPUT S$
5140 IF S$="NO" THEN 20000
5150 PRINT
5160 PRINT "SAME UNITS OF MEASUREMENT?"
5170 PRINT "(YES OR NO)"
5180 INPUT S$
5190 IF S$="NO" THEN 3000
5200 GOTO 4000
6000 REM CALCULATIONS
6010 REM A. GIVEN ACCEL. AND TIME
6020 V=A*T
```

```
6030 D=T^2*A*0.5
6040 RETURN
6050 REM B. GIVEN ACCEL. AND DISTANCE
6060 T=((2*D)/A)^0.5
6070 V=(2*A*D)^0.5
6080 RETURN
6090 REM C. GIVEN ACCEL. AND FINAL VEL.
6100 T=V/A
6110 D=(V^2)/(2*A)
6120 RETURN
6130 REM D. GIVEN FINAL VELOCITY AND DISTANCE
6140 A=(V^2)/(2*D)
6150 T=(2*D)/V
6160 RETURN
6170 REM E. GIVEN FINAL VELOCITY AND TIME
6180 A=V/T
6190 D=(V*T)/2
6200 RETURN
6210 REM F. GIVEN DISTANCE AND TIME
6220 A=(2*D)/T^2
6230 V=(2*D)/T
6240 RETURN
18000 REM SCROLL
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM DELAY
19010 FOR I=1 TO DE
19020 NEXT I
19030 RETURN
20000 REM CLOSING
20010 PRINT
20020 PRINT
20030 PRINT "I HOPE YOU HAD FUN, ";NA$;"!"
20040 PRINT "BYE FOR NOW!"
20050 END
```

TABLE OF VARIABLES

D$

1010	3070	3110	3140	3170	5030
5050	5070				

NA$

1010	2190	2230	20030

S$

1010	2510	3210	5130	5140	5180
5190					

T$

1010	3030	3090	3140	3170	3170
5030	5030	5050	5090		

L
```
   2010   2130   2170   2260   2520   3220
   4180   5010   18010
```

J
```
   2030   2040   2070
```

DE
```
   2040   2110   19010
```

I
```
   2080   2100   18010  18030  19010  19020
```

D
```
   2240   4300   4420   4520   5070   6030
   6060   6070   6110   6140   6150   6190
   6220   6230
```

SA
```
   4160   4170   4170   4200
```

A
```
   4220   4280   4340   5030   6020   6030
   6060   6070   6100   6110   6140   6180
   6220
```

T
```
   4240   4480   4540   5090   6020   6030
   6060   6100   6150   6180   6190   6220
   6230
```

V
```
   4360   4400   4460   5050   6020   6070
   6100   6110   6140   6150   6180   6190
   6230
```

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   ACCELERATION BY GARY ORWIG
1000 REM  INITIALIZATION
1010 REM USE FULL SCREEN
1020 POKE 82,0
1030 CLS
2000 REM   INTRODUCTION
2010 L = 24
2020 GOSUB 18000
2030 FOR J = 0 TO 300 STEP 8
2040 DE = 300 - J
2050 GOSUB 19000
2060 PRINT ">>>>>>>>>>ACCELERATION>>>>>>>>>>>>>>>>>";
2070 NEXT J
2080 FOR I = 1 TO 10
2090 PRINT ">>>>>>>>>>ACCELERATION>>>>>>>>>>>>>>>>>";
```

```
2100 NEXT I
2110 DE = 1000
2120 GOSUB 19000
2130 L = 24
2140 GOSUB 18000
2150 PRINT "IT'S NICE TO SEE YOU!"
2160 PRINT "WHAT IS YOUR NAME?";
2170 L = 12
2180 GOSUB 18000
2190 INPUT NA$
2200 GOSUB 18000
2210 PRINT
2220 PRINT
2230 PRINT "I HOPE YOU HAVE A GOOD TIME, ";NA$;"."
2240 D = 1500
2250 GOSUB 19000
2260 L = 24
2270 GOSUB 18000
2280 PRINT "THIS IS A PROGRAM WHICH WILL HELP"
2290 PRINT "YOU TO BETTER UNDERSTAND ACCELERATION."
2300 PRINT
2310 PRINT "YOU SHOULD FIRST READ ABOUT TIME,"
2320 PRINT "DISTANCE, VELOCITY, AND ACCELERATION"
2330 PRINT "IN A SCIENCE BOOK TO GET A BASIC "
2340 PRINT "UNDERSTANDING OF THEM."
2350 PRINT
2360 PRINT "IN THIS PROGRAM, YOU CAN PICK ANY UNITS"
2370 PRINT "YOU WANT TO USE TO REPRESENT TIME AND"
2380 PRINT "DISTANCE.  THE ANSWERS WILL BE IN THOSE"
2390 PRINT "SAME UNITS."
2400 PRINT
2410 PRINT "THERE ARE TWO LIMITATIONS..............."
2420 PRINT "DON'T TYPE IN '0' FOR A VALUE!"
2430 PRINT "(SOME OF MY EQUATIONS WOULD MAKE ME TRY"
2440 PRINT "TO DIVIDE BY 0!)"
2450 PRINT "ALSO, I DON'T CHECK TO SEE IF YOU HAVE"
2460 PRINT "ACCELERATED BEYOND THE SPEED OF LIGHT!"
2470 PRINT "(SOMETHING HARD TO DO IN REAL LIFE!)"
2480 PRINT
2490 PRINT
2500 PRINT "PRESS 'RETURN' TO CONTINUE."
2510 INPUT S$
2520 L = 24
2530 GOSUB 18000
3000 REM  SET UNITS
3010 PRINT "WHAT UNIT DO YOU WANT TO USE FOR TIME?"
3020 PRINT "(SECONDS, MINUTES, HOURS, ETC.)"
3030 INPUT T$
3040 PRINT
3050 PRINT "WHAT UNIT DO YOU WANT FOR DISTANCE?"
3060 PRINT "(METERS, KILOMETERS, MILES, ETC.)"
3070 INPUT D$
3080 PRINT
3090 PRINT "TIME WILL BE IN ";T$;"."
3100 PRINT
3110 PRINT "DISTANCE WILL BE IN ";D$;"."
```

```
3120 PRINT
3130 PRINT "VELOCITY WILL BE IN"
3140 PRINT D$;" PER ";T$;"."
3150 PRINT
3160 PRINT "ACCELERATION WILL BE IN"
3170 PRINT D$;" PER ";T$;" PER ";T$;"."
3180 PRINT
3190 PRINT
3200 PRINT "PRESS 'RETURN' TO CONTINUE."
3210 INPUT S$
3220 L = 24
3230 GOSUB 18000
4000 REM   MAIN PROGRAM
4010 PRINT "SELECT ONE AND ENTER THE NUMBER."
4020 PRINT
4030 PRINT
4040 PRINT "        1. GIVEN A & T, FIND V & D"
4050 PRINT
4060 PRINT "        2. GIVEN A & D, FIND V & T"
4070 PRINT
4080 PRINT "        3. GIVEN A & V, FIND D & T"
4090 PRINT
4100 PRINT "        4. GIVEN V & D, FIND A & T"
4110 PRINT
4120 PRINT "        5. GIVEN V & T, FIND A & D"
4130 PRINT
4140 PRINT "        6. GIVEN D & T, FIND A & V"
4150 PRINT
4160 INPUT SA
4170 IF SA < 1 OR SA > 6 THEN 4010
4180 L = 24
4190 GOSUB 18000
4200 ON SA GOTO 4210,4270,4330,4390,4450,4510
4210 PRINT "ENTER A"
4220 INPUT A
4230 PRINT "ENTER T"
4240 INPUT T
4250 GOSUB 6010
4260 GOTO 5000
4270 PRINT "ENTER A"
4280 INPUT A
4290 PRINT "ENTER D"
4300 INPUT D
4310 GOSUB 6050
4320 GOTO 5000
4330 PRINT "ENTER A"
4340 INPUT A
4350 PRINT "ENTER V"
4360 INPUT V
4370 GOSUB 6090
4380 GOTO 5000
4390 PRINT "ENTER V"
4400 INPUT V
4410 PRINT "ENTER D"
4420 INPUT D
4430 GOSUB 6130
```

```
4440 GOTO 5000
4450 PRINT "ENTER V"
4460 INPUT V
4470 PRINT "ENTER T"
4480 INPUT T
4490 GOSUB 6170
4500 GOTO 5000
4510 PRINT "ENTER D"
4520 INPUT D
4530 PRINT "ENTER T"
4540 INPUT T
4550 GOSUB 6210
4560 GOTO 5000
5000 REM   PRINT ANSWERS
5010 L = 6
5020 GOSUB 18000
5030 PRINT "ACCELERATION: ";A;" ";D$;" PER ";T$;" PER ";T$
5040 PRINT
5050 PRINT "VELOCITY:     ";V;" ";D$;" PER ";T$
5060 PRINT
5070 PRINT "DISTANCE:     ";D;" ";D$
5080 PRINT
5090 PRINT "TIME:         ";T;" ";T$
5100 PRINT
5110 PRINT
5120 PRINT "ENTER MORE VALUES (YES OR NO)"
5130 INPUT S$
5140 IF S$ = "NO" THEN 20000
5150 PRINT
5160 PRINT "SAME UNITS OF MEASUREMENT?"
5170 PRINT "(YES OR NO)"
5180 INPUT S$
5190 IF S$ = "NO" THEN 3000
5200 GOTO 4000
6000 REM   CALCULATIONS
6010 REM   A. GIVEN ACCEL. AND TIME
6020 V = A * T
6030 D = T ^ 2 * A * .5
6040 RETURN
6050 REM   B. GIVEN ACCEL. AND DISTANCE
6060 T = ((2 * D) / A) ^ .5
6070 V = (2 * A * D) ^ .5
6080 RETURN
6090 REM   C. GIVEN ACCEL. AND FINAL VEL.
6100 T = V / A
6110 D = (V ^ 2) / (2 * A)
6120 RETURN
6130 REM   D. GIVEN FINAL VELOCITY AND DISTANCE
6140 A = (V ^ 2) / (2 * D)
6150 T = (2 * D) / V
6160 RETURN
6170 REM   E. GIVEN FINAL VELOCITY AND TIME
6180 A = V / T
6190 D = (V * T) / 2
6200 RETURN
6210 REM   F. GIVEN DISTANCE AND TIME
```

```
6220 A = (2 * D) / T ^ 2
6230 V = (2 * D) / T
6240 RETURN
18000 REM  SCROLL
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM  DELAY
19010 FOR I = 1 TO DE
19020 NEXT I
19030 RETURN
20000 REM  CLOSING
20010 PRINT
20020 PRINT
20030 PRINT "I HOPE YOU HAD FUN, ";NA$;"!"
20040 PRINT "BYE FOR NOW!"
20050 END
```

TABLE OF VARIABLES

```
A - ACCELERATION
4220 4280 4340 5030 6020 6030
6060 6070 6100 6110 6140 6180
6220

D - DISTANCE
2240 4300 4420 4520 5070 6030
6060 6070 6110 6140 6150 6190
6220 6230

D$ - DISTANCE UNIT
3070 3110 3140 3170 5030 5050
5070

DE - DELAY
2040 2110 19010

I - COUNTER
2080 2100 18010 18030 19010
19020

J - COUNTER
2030 2040 2070

L - LINES OF SCROLLING
2010 2130 2170 2260 2520 3220
4180 5010 18010

NA$ - NAME
2190 2230 20030

S$ - STUDENT INPUT
2510 3210 5130 5140 5180 5190
```

SA - STUDENT INPUT
4160 4170 4170 4200

T - TIME
4240 4480 4540 5090 6020 6030
6060 6100 6150 6180 6190 6220
6230

T$ - TIME UNIT
3030 3090 3140 3170 3170 5030
5030 5050 5090

V - VELOCITY
4360 4400 4460 5050 6020 6070
6100 6110 6140 6150 6180 6190
6230

END OF VAR. LIST

SAMPLE RUN

IT'S NICE TO SEE YOU!
WHAT IS YOUR NAME?

?CARRIE

I HOPE YOU HAVE A GOOD TIME, CARRIE.

THIS IS A PROGRAM WHICH WILL HELP
YOU TO BETTER UNDERSTAND ACCELERATION.

YOU SHOULD FIRST READ ABOUT TIME,
DISTANCE, VELOCITY, AND ACCELERATION
IN A SCIENCE BOOK TO GET A BASIC
UNDERSTANDING OF THEM.

IN THIS PROGRAM, YOU CAN PICK ANY UNITS
YOU WANT TO USE TO REPRESENT TIME AND
DISTANCE. THE ANSWERS WILL BE IN THOSE
SAME UNITS.

THERE ARE TWO LIMITATIONS..............
DON'T TYPE IN 'O' FOR A VALUE!
(SOME OF MY EQUATIONS WOULD MAKE ME TRY
TO DIVIDE BY O!)
ALSO, I DON'T CHECK TO SEE IF YOU HAVE
ACCELERATED BEYOND THE SPEED OF LIGHT!
(SOMETHING HARD TO DO IN REAL LIFE!)

PRESS 'RETURN' TO CONTINUE.
?

```
WHAT UNIT DO YOU WANT TO USE FOR TIME?
(SECONDS, MINUTES, HOURS, ETC.)
?SECONDS

WHAT UNIT DO YOU WANT FOR DISTANCE?
(METERS, KILOMETERS, MILES, ETC.)
?FEET

TIME WILL BE IN SECONDS.

DISTANCE WILL BE IN FEET.

VELOCITY WILL BE IN
FEET PER SECONDS.

ACCELERATION WILL BE IN
FEET PER SECONDS PER SECONDS.


PRESS 'RETURN' TO CONTINUE.
?


SELECT ONE AND ENTER THE NUMBER.


        1. GIVEN A & T, FIND V & D

        2. GIVEN A & D, FIND V & T

        3. GIVEN A & V, FIND D & T

        4. GIVEN V & D, FIND A & T

        5. GIVEN V & T, FIND A & D

        6. GIVEN D & T, FIND A & V

?5


ENTER V
?300
ENTER T
?2


ACCELERATION: 150 FEET PER SECONDS PER SECONDS

VELOCITY:     300 FEET PER SECONDS

DISTANCE:     300 FEET

TIME:         2 SECONDS


ENTER MORE VALUES (YES OR NO)
?NO
```
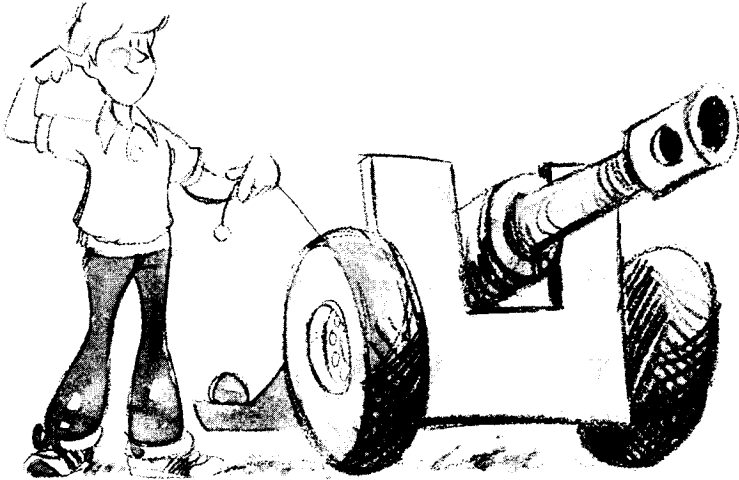
I HOPE YOU HAD FUN, CARRIE!
BYE FOR NOW!

Ballistics

PROGRAM DESCRIPTION

The science of ballistics is demonstrated in this program. The computer simulates the flight of a cannonball. You must supply the angle at which the cannon is to be fired. This angle is expressed in a range of "0" to "90" degrees. In addition, you will have to decide on the velocity of the cannonball since you can vary the amount of gunpowder in the cannon. As a helpful hint, velocities in the range of 200 to 300 meters per second are usually very effective. The object is to hit the target in as few tries as possible.

This program calculates the "pure" parabolic path of the projectile. It does not consider wind resistance.

PROGRAM NOTES

1. This is a program for the graphics enthusiast. If you have graphics ability, you can plot the trajectory by incrementing time (figure altitude and range every 0.5 seconds of flight time). Then plot appropriate values of X and Y on the screen.

2. There seems to be some problem with getting the Microsoft BASIC to print out 40 characters. Even with the POKE 82,0 command, it wants to cut the display after 38 characters on a line. As a result, the "firing range" is a bit shorter for the Microsoft BASIC version. Certainly there must be another POKE around somewhere to fix this!

3. Depending on the level of the students, you might want to add prompting, like "Try a slightly lower angle," etc.

PROGRAM LISTING: BASIC

```
100 REM BALLISTICS BY GARY ORWIG
1000 REM INITILIZATION
1010 G=9.8
1020 DIM NA$(30),S$(10)
1030 REM USE FULL SCREEN
1040 POKE 82,0
1050 PRINT
2000 REM INTRODUCTION
2010 FOR I=1 TO 10
2020 FOR J=1 TO I
2030 PRINT "BALLISTICS       ";
2040 NEXT J
2050 PRINT
2060 PRINT
2070 NEXT I
2080 DE=200
2090 GOSUB 19000
2100 L=24
2110 GOSUB 18000
2120 PRINT "WHAT IS YOUR NAME?"
2130 L=12
2140 GOSUB 18000
2150 INPUT NA$
2160 PRINT
2170 PRINT "NICE TO MEET YOU, ";NA$;"."
2180 L=3
2190 GOSUB 18000
2200 PRINT "THIS IS A PROGRAM WHICH SIMULATES THE"
2210 PRINT "FLIGHT OF A CANNON BALL."
2220 PRINT
2230 PRINT "YOU MUST SUPPLY THE ANGLE AT WHICH"
2240 PRINT "THE GUN IS TO BE FIRED.  THIS IS AN"
2250 PRINT "ANGLE EXPRESSED IN A RANGE OF "
2260 PRINT "0 TO 90 DEGREES."
2270 PRINT
2280 PRINT "IN ADDITION, YOU WILL HAVE TO DECIDE"
2290 PRINT "ON THE VELOCITY OF THE CANNON BALL."
2300 PRINT "SINCE YOU CAN VARY THE AMOUNT OF "
2310 PRINT "GUNPOWDER IN THE CANNON, THIS IS NOT"
2320 PRINT "A PROBLEM.  USUALLY VELOCITIES IN THE"
2330 PRINT "RANGE OF 200 TO 300 METERS PER SECOND"
2340 PRINT "ARE EFFECTIVE."
2350 PRINT
2360 PRINT "PRESS 'RETURN' TO CONTINUE."
2370 INPUT S$
2380 L=13
2390 GOSUB 18000
2400 PRINT "        HERE WE GO!"
2410 GOSUB 18000
2420 DE=200
```

```
2430 GOSUB 19000
4000 REM MAIN PROGRAM
4010 GOSUB 10000
4020 L=24
4030 GOSUB 18000
4040 PRINT "TARGET RANGE IS ";RX;" METERS."
4050 PRINT "ENTER ELEVATION ANGLE IN DEGREES:";
4060 INPUT ED
4070 IF ED<90 THEN 4100
4080 PRINT "YOU'RE SHOOTING THE WRONG WAY, ";NA$;"!"
4090 GOTO 4050
4100 PRINT "ENTER VELOCITY IN M/S:";
4110 INPUT VI
4120 GOSUB 6000
4130 GOSUB 18000
4140 PRINT "                  BOOM!"
4150 GOSUB 18000
4160 PRINT
4170 PRINT "ELEVATION:           ";ED;" DEGREES"
4180 PRINT
4190 PRINT "INIT. VELOCITY:      ";VI;" M/S"
4200 PRINT
4210 PRINT "TOTAL DISTANCE:      ";D;" METERS"
4220 PRINT
4230 PRINT "MAXIMUM ELEVATION:   ";H;" METERS"
4240 PRINT
4250 PRINT "TOTAL TIME IN AIR:   ";T;" SEC."
4260 PRINT
4270 PRINT
4280 GOSUB 7000
4290 GOSUB 11000
4300 IF HT=2 THEN 12000
4310 IF HT=1 THEN GOSUB 12500
4320 IF HT=0 THEN GOSUB 14000
4330 GOTO 4040
6000 REM CALULATIONS
6010 ER=ED*0.0174533
6020 H=(VI*SIN(ER))^2/(2*G)
6030 H=INT(H)
6040 T=(2*VI*SIN(ER))/G
6050 D=COS(ER)*VI*T
6060 T=INT(T)
6070 D=INT(D)
6080 DB=INT((D/200)+0.5)
6090 RETURN
7000 REM PLOT RESULTS
7010 PRINT
7020 PRINT
7030 IF DB<41 THEN 7070
7040 PRINT "              OUT OF SIGHT!"
7050 PRINT "                                    >>>"
7060 GOTO 7150
7070 FOR I=1 TO DB-3
7080 PRINT " ";
7090 NEXT I
7100 PRINT "CRASH"
```

```
7110 FOR I=1 TO DB-1
7120 PRINT " ";
7130 NEXT I
7140 PRINT "#"
7150 PRINT "X/";
7160 FOR I=1 TO DT-4
7170 PRINT " ";
7180 NEXT I
7190 PRINT "^^^"
7200 FOR I=1 TO 40
7210 PRINT "*";
7220 NEXT I
7230 FOR I=1 TO DT-1
7240 PRINT " ";
7250 NEXT I
7260 PRINT "^"
7270 FOR I=1 TO DT-3
7280 PRINT " ";
7290 NEXT I
7300 PRINT RX
7310 RETURN
10000 REM RANDOMIZATION OF RANGE
10010 R=INT(RND(0)*11)
10020 RX=5000+(200*R)
10030 DT=INT((RX/200)+0.5)
10040 RETURN
11000 REM JUDGE RESULTS
11010 HT=0
11020 IF DB=DT THEN HT=2
11030 IF DB=DT+1 THEN HT=1
11040 IF DB=DT-1 THEN HT=1
11050 RETURN
12000 REM REWARD
12010 FOR I=1 TO 60
12020 PRINT "     KAPOW!!    ";
12030 NEXT I
12040 PRINT
12050 PRINT
12060 PRINT "DIRECT HIT!"
12070 DE=200
12080 GOSUB 19000
12090 L=24
12100 GOSUB 18000
12110 GOTO 20000
12500 REM CLOSE HIT
12510 PRINT "OUCH!! DAMAGED, BUT NOT OUT!"
12520 RETURN
14000 REM MISS
14010 PRINT "HA HA!  MISSED ME!!"
14020 RETURN
18000 REM SCROLLING
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM DELAY
```

```
19010 FOR I=1 TO DE
19020 NEXT I
19030 RETURN
20000 REM CLOSING
20010 PRINT "WANT TO TRY AGAIN?"
20020 PRINT "TYPE IN 'YES' OR 'NO'"
20030 INPUT S$
20040 IF S$="YES" THEN 4000
20050 PRINT "BYE FOR NOW, ";NA$;"!"
```

TABLE OF VARIABLES

G

| 1010 | 6020 | 6040 |

NA$

| 1020 | 2150 | 2170 | 4080 | 20050 |

S$

| 1020 | 2370 | 20030 | 20040 |

I

2010	2020	2070	7070	7090	7110
7130	7160	7180	7200	7220	7230
7250	7270	7290	12010	12030	18010
18030	19010	19020

J

| 2020 | 2040 |

DE

| 2080 | 2420 | 12070 | 19010 |

L

| 2100 | 2130 | 2180 | 2380 | 4020 | 12090 |
| 18010 |

RX

| 4040 | 7300 | 10020 | 10030 |

ED

| 4060 | 4070 | 4170 | 6010 |

VI

| 4110 | 4190 | 6020 | 6040 | 6050 |

D

| 4210 | 6050 | 6070 | 6070 | 6080 |

H

| 4230 | 6020 | 6030 | 6030 |

T

| 4250 | 6040 | 6050 | 6060 | 6060 |

HT
    4300   4310   4320   11010 11020 11030
    11040

ER
    6010   6020   6040   6050

DB
    6080   7030   7070   7110   11020 11030
    11040

DT
    7160   7230   7270   10030 11020 11030
    11040

R
    10010 10020

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   BALLISTICS BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM   INITILIZATION
1010 G = 9.80
1020 REM USE FULL SCREEN
1030 POKE 82,0
1040 CLS
2000 REM   INTRODUCTION
2010 FOR I = 1 TO 10
2020 FOR J = 1 TO I
2030 PRINT "BALLISTICS        ";
2040 NEXT J
2050 PRINT
2060 PRINT
2070 NEXT I
2080 DE = 1000
2090 GOSUB 19000
2100 L = 24
2110 GOSUB 18000
2120 PRINT "WHAT IS YOUR NAME?"
2130 L = 12
2140 GOSUB 18000
2150 INPUT NA$
2160 PRINT
2170 PRINT "NICE TO MEET YOU, ";NA$;"."
2180 L = 3
2190 GOSUB 18000
2200 PRINT "THIS IS A PROGRAM WHICH SIMULATES THE"
2210 PRINT "FLIGHT OF A CANNON BALL."
2220 PRINT
2230 PRINT "YOU MUST SUPPLY THE ANGLE AT WHICH"
2240 PRINT "THE GUN IS TO BE FIRED.  THIS IS AN"
2250 PRINT "ANGLE EXPRESSED IN A RANGE OF "
2260 PRINT "0 TO 90 DEGREES."
```

```
2270 PRINT
2280 PRINT "IN ADDITION, YOU WILL HAVE TO DECIDE"
2290 PRINT "ON THE VELOCITY OF THE CANNON BALL."
2300 PRINT "SINCE YOU CAN VARY THE AMOUNT OF "
2310 PRINT "GUNPOWDER IN THE CANNON, THIS IS NOT"
2320 PRINT "A PROBLEM.  USUALLY VELOCITIES IN THE"
2330 PRINT "RANGE OF 200 TO 300 METERS PER SECOND"
2340 PRINT "ARE EFFECTIVE."
2350 PRINT
2360 PRINT "PRESS 'RETURN' TO CONTINUE."
2370 INPUT S$
2380 L = 13
2390 GOSUB 18000
2400 PRINT "          HERE WE GO!"
2410 GOSUB 18000
2420 DE = 1000
2430 GOSUB 19000
4000 REM  MAIN PROGRAM
4010 GOSUB 10000
4020 L = 24
4030 GOSUB 18000
4040 PRINT "TARGET RANGE IS ";RX;" METERS."
4050 PRINT "ENTER ELEVATION ANGLE IN DEGREES:";
4060 INPUT ED
4070 IF ED < 90 THEN 4100
4080 PRINT "YOU'RE SHOOTING THE WRONG WAY, ";NA$;"!"
4090 GOTO 4050
4100 PRINT "ENTER VELOCITY IN M/S:";
4110 INPUT VI
4120 GOSUB 6000
4130 GOSUB 18000
4140 PRINT "                BOOM!"
4150 GOSUB 18000
4160 PRINT
4170 PRINT "ELEVATION:          ";ED;" DEGREES"
4180 PRINT
4190 PRINT "INIT. VELOCITY:     ";VI;" M/S"
4200 PRINT
4210 PRINT "TOTAL DISTANCE:     ";D;" METERS"
4220 PRINT
4230 PRINT "MAXIMUM ELEVATION:  ";H;" METERS"
4240 PRINT
4250 PRINT "TOTAL TIME IN AIR:  ";T;" SEC."
4260 PRINT
4270 PRINT
4280 GOSUB 7000
4290 GOSUB 11000
4300 IF HT = 2 THEN 12000
4310 IF HT = 1 THEN  GOSUB 12500
4320 IF HT = 0 THEN  GOSUB 14000
4330 GOTO 4040
6000 REM  CALULATIONS
6010 ER = ED * .0174533
6020 H = (VI *  SIN (ER)) ^ 2 / (2 * G)
6030 H =   INT (H)
6040 T = (2 * VI *  SIN (ER)) / G
```

```
6050 D =  COS (ER) * VI * T
6060 T =  INT (T)
6070 D =  INT (D)
6080 DB =  INT ((D / 200) + .5)
6090 RETURN
7000 REM  PLOT RESULTS
7010 PRINT
7020 PRINT
7030 IF DB < 41 THEN 7070
7040 PRINT "              OUT OF SIGHT!"
7050 PRINT "                                              >>>"
7060 GOTO 7150
7070 FOR I = 1 TO DB - 3
7080 PRINT " ";
7090 NEXT I
7100 PRINT "CRASH"
7110 FOR I = 1 TO DB - 1
7120 PRINT " ";
7130 NEXT I
7140 PRINT "#"
7150 PRINT "X/";
7160 FOR I = 1 TO DT - 4
7170 PRINT " ";
7180 NEXT I
7190 PRINT "^^^"
7200 FOR I = 1 TO 38
7210 PRINT "*";
7220 NEXT I
7230 PRINT
7240 FOR I = 1 TO DT - 1
7250 PRINT " ";
7260 NEXT I
7270 PRINT "^"
7280 FOR I = 1 TO DT - 3
7290 PRINT " ";
7300 NEXT I
7310 PRINT RX
7320 RETURN
10000 REM     RANDOMIZATION OF RANGE
10010 R = RND(9)-1
10020 RX = 5000 + (200 * R)
10030 DT =  INT ((RX / 200) + .5)
10040 RETURN
11000 REM  JUDGE RESULTS
11010 HT = 0
11020 IF DB = DT THEN HT = 2
11030 IF DB = DT + 1 THEN HT = 1
11040 IF DB = DT - 1 THEN HT = 1
11050 RETURN
12000 REM  REWARD
12010 FOR I = 1 TO 60
12020 PRINT "     KAPOW!!    ";
12030 NEXT I
12040 PRINT
12050 PRINT
12060 PRINT "DIRECT HIT!"
```

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```
12070 DE = 1000
12080 GOSUB 19000
12090 L = 24
12100 GOSUB 18000
12110 GOTO 20000
12500 REM   CLOSE HIT
12510 PRINT "OUCH!! DAMAGED, BUT NOT OUT!"
12520 RETURN
14000 REM   MISS
14010 PRINT "HA HA!  MISSED ME!!"
14020 RETURN
18000 REM   SCROLLING
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM   DELAY
19010 FOR I = 1 TO DE
19020 NEXT I
19030 RETURN
20000 REM   CLOSING
20010 PRINT "WANT TO TRY AGAIN?"
20020 PRINT "TYPE IN 'YES' OR 'NO'"
20030 INPUT S$
20040 IF S$ = "YES" THEN 4000
20050 PRINT "BYE FOR NOW, ";NA$;"!"
```

TABLE OF VARIABLES

```
D - TOTAL DISTANCE
4210 6050 6070 6070 6080

DB - DISTANCE IN SCALE
6080 7030 7070 7110 11020 11030
11040

DE - DELAY
2080 2420 12070 19010

DT - DISTANCE TO TARGET IN SCALE
7160 7230 7270 10030 11020
11030 11040

ED - ELEVATION IN DEGREES
4060 4070 4170 6010

ER - ELEVATION IN RADIANS
6010 6020 6040 6050

G - ACCELERATION OF GRAVITY
1010 6020 6040

H - MAXIMUM ELEVATION
4230 6020 6030 6030
```

HT - HIT
4300 4310 4320 11010 11020
11030 11040

I - COUNTER
2010 2020 2070 7070 7090 7110
7130 7160 7180 7200 7220 7230
7250 7270 7290 12010 12030
18010 18030 19010 19020

J - COUNTER
2020 2040

L - SCROLLING LINES
2100 2130 2180 2380 4020 12090
18010

NA$ - NAME
2150 2170 4080 20050

R - RANDOM NUMBER
10010 10020

RX - TARGET RANGE IN METERS
4040 7300 10020 10030

S$ - STUDENT INPUT
2370 20030 20040

T - TIME IN AIR IN SECONDS
4250 6040 6050 6060 6060

VI - INITIAL VELOCITY
4110 4190 6020 6040 6050

END OF VAR. LIST

SAMPLE RUN

WHAT IS YOUR NAME?

?BRAD

NICE TO MEET YOU, BRAD.

THIS IS A PROGRAM WHICH SIMULATES THE
FLIGHT OF A CANNON BALL.

YOU MUST SUPPLY THE ANGLE AT WHICH
THE GUN IS TO BE FIRED. THIS IS AN
ANGLE EXPRESSED IN A RANGE OF
0 TO 90 DEGREES.

IN ADDITION, YOU WILL HAVE TO DECIDE
ON THE VELOCITY OF THE CANNON BALL.

SINCE YOU CAN VARY THE AMOUNT OF
GUNPOWDER IN THE CANNON, THIS IS NOT
A PROBLEM. USUALLY VELOCITIES IN THE
RANGE OF 200 TO 300 METERS PER SECOND
ARE EFFECTIVE.

PRESS 'RETURN' TO CONTINUE.
?

        HERE WE GO!

TARGET RANGE IS 6200 METERS.
ENTER ELEVATION ANGLE IN DEGREES:?45
ENTER VELOCITY IN M/S:?250

        BOOM!

ELEVATION: 45 DEGREES

INIT. VELOCITY: 250 M/S

TOTAL DISTANCE: 6377 METERS

MAXIMUM ELEVATION: 1594 METERS

TOTAL TIME IN AIR: 36 SEC.

                            CRASH
                              #
X/   ^^^
****
                             ^
                            6200
OUCH!! DAMAGED, BUT NOT OUT!
TARGET RANGE IS 6200 METERS.
ENTER ELEVATION ANGLE IN DEGREES:?44
ENTER VELOCITY IN M/S:?250

        BOOM!

ELEVATION: 44 DEGREES

INIT. VELOCITY: 250 M/S

TOTAL DISTANCE: 6373 METERS

MAXIMUM ELEVATION: 1538 METERS

TOTAL TIME IN AIR: 35 SEC.


```
                              CRASH
                               #
X/                            ^^^
*****************************************
                              ^
                             6200
OUCH!! DAMAGED, BUT NOT OUT!
TARGET RANGE IS 6200 METERS.
ENTER ELEVATION ANGLE IN DEGREES:?40
ENTER VELOCITY IN M/S:?250


             BOOM!
```


ELEVATION: 40 DEGREES

INIT. VELOCITY: 250 M/S

TOTAL DISTANCE: 6280 METERS

MAXIMUM ELEVATION: 1317 METERS

TOTAL TIME IN AIR: 32 SEC.


```
                              CRASH
                               #
X/                            ^^^
*****************************************
                              ^
                             6200
        KAPOW!!        KAPOW!!        KAPOW!!        KAPOW!!
        KAPOW!!        KAPOW!!        KAPOW!!        KAPOW!!
        KAPOW!!        KAPOW!!        KAPOW!!        KAPOW!!
        KAPOW!!        KAPOW!!        KAPOW!!        KAPOW!!
        KAPOW!!                                     KAPOW!!
   KAPOW!!        KAPOW!!        KAPOW!!        KAPOW!!
   KAPOW!!        KAPOW!!        KAPOW!!        KAPOW!!
   KAPOW!!        KAPOW!!        KAPOW!!        KAPOW!!
   KAPOW!!        KAPOW!!        KA                      POW
    !!        KAPOW!!        KAPOW!!        KAPOW!!        KAPOW
    !!        KAPOW!!        KAPOW!!        KAPOW!!        KAPOW
    !!        KAPOW!!        KAPOW!!        KAPOW!!        KAPOW
    !!        KAPOW!!        KAPOW!!        KAPOW!!
```

```
                    KAPOW!!        KAPOW!!        KAPOW!!
    KAPOW!!         KAPOW!!        KAPOW!!        KAPOW!!
    KAPOW!!         KAPOW!!        KAPOW!!        KAPOW!!
    KAPOW!!

DIRECT HIT!


WANT TO TRY AGAIN?
TYPE IN 'YES' OR 'NO'
?NO
BYE FOR NOW, BRAD!
```
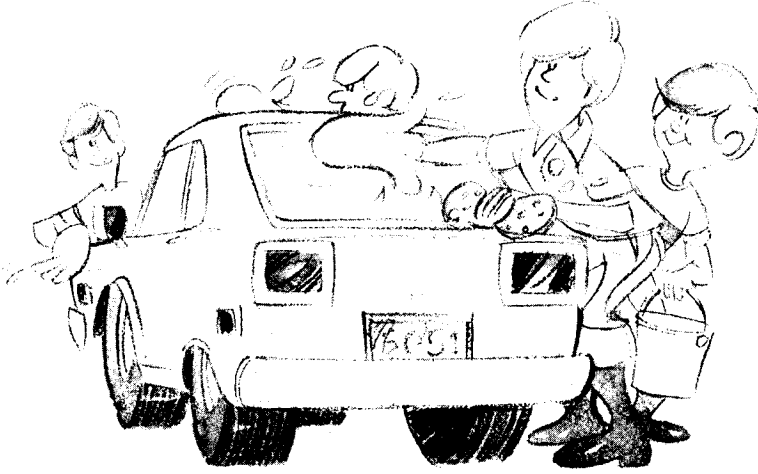
Car Wash

PROGRAM DESCRIPTION

This program simulates the planning and operation of a typical car wash. You operate a car wash for five Saturdays with the sole objective of making as much money as you possibly can. You have a total of five helpers, each of whom can wash a maximum of 20 cars during the day. One important hint: Pay careful attention to the weather forecasts, since rainy days can cause you to lose a great deal of money!

The main variables in this program are as follows:

A. Price per wash

B. Weather

C. Amount of advertising

D. Traffic

E. Number of helpers

PROGRAM NOTES

1. You can vary the weather by changing variables A, B, C, and D in lines 6400–6620. These four variables represent the odds given to the four outcomes by any of the four predictions.

2. Consider adding other factors such as: A. Gas station owner demands 10 dollars per day rent. B. Sunburn strikes down 2 workers.

3. Consider using the PRINT USING command in the Microsoft BASIC to smooth out the display of dollars and cents.

PROGRAM LISTING: BASIC

```
100 REM CAR WASH BY GARY ORWIG
1000 REM INITIALIZATION
1010 BA=25
1020 WA=5
1030 DIM S$(5),SF$(30),WF$(30),WP$(30)
1040 REM USE FULL SCREEN
1050 POKE 82,0
1060 PRINT
2000 REM INTRODUCTION
2010 L=24
2020 GOSUB 18000
2030 PRINT "                CAR WASH!"
2040 L=12
2050 GOSUB 18000
2060 DE=200
2070 GOSUB 19000
2080 L=24
2090 GOSUB 18000
2100 PRINT "YOU ARE GOING TO START A CAR WASH!"
2110 PRINT
2120 PRINT "YOU WILL RUN IT FOR FIVE DAYS"
2130 PRINT "WITH THE SOLE OBJECT BEING TO MAKE"
2140 PRINT "AS MUCH MONEY AS POSSIBLE!"
2150 PRINT
2160 PRINT "YOU WILL HAVE A TOTAL OF 5 WORKERS,"
2170 PRINT "EACH OF WHOM CAN WASH A MAXIMUM OF"
2180 PRINT "20 CARS DURING THE DAY."
2190 PRINT
2200 PRINT "AS YOU WILL SEE, THERE ARE A"
2210 PRINT "NUMBER OF FACTORS YOU MUST CONSIDER,"
2220 PRINT "BUT BY ALL MEANS, YOU NEED TO WATCH"
2230 PRINT "THE WEATHER FORECASTS, SINCE RAINY"
2240 PRINT "WEATHER WILL DO YOU IN!"
2250 PRINT
2260 PRINT "THE ONLY WAY TO LEARN IS BY DOING,SO"
2270 PRINT "WHEN YOU ARE READY, PUSH THE 'RETURN'"
2280 PRINT "KEY."
2290 L=3
2300 GOSUB 18000
2310 INPUT S$
4000 REM MAIN PROGRAM
4010 DA=DA+1
4020 IF DA=6 THEN 20000
4030 WA=5
4040 L=24
4050 GOSUB 18000
4060 PRINT "TODAY IS DAY NUMBER ";DA;"."
4070 L=6
4080 GOSUB 18000
4090 DE=200
4100 GOSUB 19000
4110 GOSUB 6320
4120 PRINT
4130 PRINT "THE WEATHER FORECAST IS:"
4140 PRINT WP$
4150 L=12
```

```
4160 GOSUB 18000
4170 DE=200
4180 GOSUB 19000
4190 GOSUB 18000
4200 PRINT "YOU HAVE A BALANCE OF ";BA;" DOLLARS."
4210 PRINT
4220 PRINT "WHAT PRICE ARE YOU GOING TO CHARGE";
4230 INPUT P
4240 GOSUB 6010
4250 IF P<0.26 OR P>4.49 THEN 4220
4260 PRINT
4270 PRINT "IT COSTS ABOUT .25 PER CAR FOR MATERIALS"
4280 PRINT "PRESENTLY YOU HAVE ";MM;" DOLLARS"
4290 PRINT "WORTH OF SOAP,SPONGES,RAGS,ETC."
4300 PRINT "DO YOU WISH TO ADD TO THIS (YES OR NO)"
4310 INPUT S$
4320 IF S$="NO" THEN 4400
4330 PRINT
4340 PRINT "ENTER THE AMOUNT YOU WANT TO ADD."
4350 INPUT SA
4360 GOSUB 7000
4370 IF SA>0 THEN 4340
4380 PRINT "YOU NOW HAVE $";MM;" WORTH OF MATERIALS."
4390 PRINT "AND A BALANCE OF $";BA
4400 PRINT
4410 REM
4420 PRINT "BALANCE = $";BA
4430 PRINT "AMOUNT SPENT ON ADVERTISING = $";TT
4440 PRINT "YOU HAVE A CHOICE OF THE FOLLOWING"
4450 PRINT "FORMS OF ADVERTISING:"
4460 PRINT
4470 PRINT "   MEDIUM     COST PER UNIT"
4480 PRINT
4490 PRINT "1. RADIO          $20.00"
4500 PRINT "2. NEWSPAPER       $5.00"
4510 PRINT "3. POSTERS         $1.00"
4520 PRINT "4. KIDS AT CURB    $1.00"
4530 PRINT
4540 PRINT "PICK A NUMBER (OR 0 FOR NONE)."
4550 INPUT SA
4560 IF SA=0 THEN 4750
4570 IF SA=4 THEN 4610
4580 PRINT "HOW MANY UNITS?"
4590 INPUT UN
4600 GOSUB 4710
4610 PRINT "YOU NOW HAVE ";WA;" KIDS TO WASH CARS"
4620 PRINT "AND ";5-WA;" KIDS AT THE CURB"
4630 PRINT "WAVING CARS IN.  EACH KID AT THE CURB"
4640 PRINT "HAS A POSTER ($1.00) AND A BIG SMILE,"
4650 PRINT "********BUT THEY CAN'T WASH CARS !******"
4660 PRINT
4670 PRINT "HOW MANY OF YOUR 5 KIDS DO YOU WANT AT"
4680 PRINT "THE CURB?"
4690 WA=5
4700 INPUT UN
4710 GOSUB 6130
4720 TT=TT+TL
4730 BA=BA-TL
```

```
4740 GOTO 4410
4750 REM
5000 REM LIST VARIABLES
5010 L=24
5020 GOSUB 18000
5030 PRINT " SUMMARY FOR START OF DAY ";DA
5040 PRINT
5050 PRINT "WEATHER FORECAST: ";WP$
5060 PRINT
5070 PRINT "CASH ON HAND : $";BA
5080 PRINT
5090 PRINT "CASH VALUE OF CAR WASH SUPPLIES : $";MM
5120 PRINT
5130 PRINT "NUMBER OF 'CURB KIDS': ";5-WA
5140 PRINT
5150 PRINT "NUMBER OF CAR WASHERS: ";WA
5160 PRINT
5170 PRINT "PRICE PER CAR: $";P
5180 PRINT
5190 PRINT "PRESS 'RETURN'"
5200 PRINT "TO GET THE DAY GOING!"
5210 L=3
5220 GOSUB 18000
5230 INPUT S$
5500 REM WASH CARS!
5510 GOSUB 6640
5520 GOSUB 6750
5530 GOSUB 6850
5540 IC=P*VW
5550 BA=BA+IC
5560 PRINT "WEATHER: ";WF$
5570 PRINT "TRAFFIC: ";SF$
5580 PRINT "VEHICLES WASHED: ";VW
5590 PRINT "VEHICLES NOT WASHED: ";VI-VW
5600 PRINT "INCOME: $";IC
5610 PRINT "COST OF MATERIALS USED: $";VW*0.25
5620 PRINT "MATERIALS STARTED WITH: $";MM
5630 PRINT "BALANCE ON HAND: $";BA
5640 MM=MM-(VW*0.25)
5650 TT=0
5660 PRINT
5670 IF VI>WA*20 THEN PRINT "TOO MANY CARS FOR ";WA;" WASHER
S!"
5680 IF MM<0.25 THEN PRINT "OUT OF SUPPLIES!"
5690 PRINT
5700 PRINT "PRESS 'RETURN' TO CONTINUE."
5710 L=6
5720 GOSUB 18000
5730 INPUT S$
5740 GOTO 4000
6000 REM CALCULATIONS
6010 REM PRICE FACTOR
6020 IF P<4.5 THEN 6040
6030 PRINT "YOUR PRICE IS TOO HIGH!"
6040 IF P>0.25 THEN 6060
6050 PRINT "YOUR PRICE IS TOO LOW!"
6060 IF P<0.76 THEN PF=2
6070 IF P>0.75 AND P<1.26 THEN PF=1.5
```

```
6080 IF P>1.25 AND P<1.76 THEN PF=1
6090 IF P>1.75 AND P<2.51 THEN PF=0.75
6100 IF P>2.5 AND P<3.51 THEN PF=0.5
6110 IF P>3.5 THEN PF=0.25
6120 RETURN
6130 REM ADVERTISING FACTOR
6140 ON SA GOTO 6150,6190,6230,6270
6150 TL=20*UN
6160 GOSUB 11000
6170 AF=AF+0.1*UN
6180 RETURN
6190 TL=5*UN
6200 GOSUB 11000
6210 AF=AF+0.05*UN
6220 RETURN
6230 TL=1*UN
6240 GOSUB 11000
6250 AF=AF+0.02*UN
6260 RETURN
6270 TL=1*UN
6280 WA=WA-UN
6290 GOSUB 11000
6300 AF=AF+0.2*UN
6310 RETURN
6320 REM WEATHER PREDICTION
6330 N=100
6340 GOSUB 10000
6350 IF R<31 THEN WP=1
6360 IF R>30 AND R<61 THEN WP=2
6370 IF R>60 AND R<86 THEN WP=3
6380 IF R>85 THEN WP=4
6390 ON WP GOTO 6400,6460,6520,6580
6400 WP$="10% CHANCE OF RAIN"
6410 A=50
6420 B=30
6430 C=10
6440 D=10
6450 RETURN
6460 WP$="25% CHANCE OF RAIN"
6470 A=30
6480 B=35
6490 C=20
6500 D=15
6510 RETURN
6520 WP$="50% CHANCE OF RAIN"
6530 A=15
6540 B=20
6550 C=30
6560 D=35
6570 RETURN
6580 WP$="90% CHANCE OF RAIN"
6590 A=5
6600 B=10
6610 C=20
6620 D=65
6630 RETURN
```

```
6640 REM ACTUAL WEATHER
6650 GOSUB 10000
6660 IF R<A+1 THEN WF=1.5
6670 IF R>A AND R<A+B+1 THEN WF=1
6680 IF R>A+B AND R<A+B+C+1 THEN WF=0.5
6690 IF R>A+B+C THEN WF=1.0E-03
6700 IF WF=1.5 THEN WF$="HOT AND SUNNY"
6710 IF WF=1 THEN WF$="PARTLY SUNNY"
6720 IF WF=0.5 THEN WF$="CLOUDY"
6730 IF WF=1.0E-03 THEN WF$="RAIN!"
6740 RETURN
6750 REM STREET FACTOR
6760 N=10
6770 GOSUB 10000
6780 IF R<4 THEN SF=1.3
6790 IF R>3 AND R<10 THEN SF=1
6800 IF R=10 THEN SF=0.5
6810 IF SF=1.3 THEN SF$="HEAVY TRAFFIC"
6820 IF SF=1 THEN SF$="AVERAGE TRAFFIC"
6830 IF SF=0.5 THEN SF$="STREET REPAIRS!"
6840 RETURN
6850 REM BUSINESS FOR DAY
6860 VI=INT(50*PF*(AF+1)*WF*SF)
6870 VM=WA*20
6880 ML=MM/0.25
6890 IF VI<VM THEN 6920
6900 VW=VM
6910 GOTO 6950
6920 VW=VI
6930 IF VW<ML THEN 6950
6940 VW=ML
6950 RETURN
7000 REM ADD TO MATERIALS
7010 IF SA>BA THEN GOTO 7060
7020 BA=BA-SA
7030 MM=MM+SA
7040 SA=0
7050 RETURN
7060 PRINT "THAT'S MORE THAN YOU HAVE!"
7070 RETURN
10000 REM RANDOMIZATION
10010 R=INT(RND(0)*N)+1
10020 RETURN
11000 REM CHECK BALANCE
11010 IF TL>BA OR WA<1 THEN 11030
11020 RETURN
11030 IF TL>BA THEN GOTO 11050
11040 GOTO 11080
11050 PRINT "YOU DON'T HAVE $";TL;"!"
11060 TL=0
11070 GOTO 4400
11080 PRINT "THERE'S NO ONE LEFT TO WASH CARS!"
11090 GOTO 4610
18000 REM SCROLLING
18010 FOR I=1 TO L
18020 PRINT
```

```
18030 NEXT I
18040 RETURN
19000 REM DELAY
19010 FOR I=1 TO DE
19020 NEXT I
19030 RETURN
20000 REM CLOSING
20010 L=24
20020 GOSUB 18000
20030 PRINT "YOUR 5 DAYS ARE OVER!"
20040 PRINT
20050 PRINT "YOU HAVE ACCUMULATED A TOTAL OF "
20060 PRINT BA;" DOLLARS!"
20070 PRINT "DIVIDED 5 WAYS (REMEMBER YOUR 4"
20080 PRINT "PARTNERS), THAT MAKES ";BA/5;" DOLLARS"
20090 PRINT "PER PERSON!"
20100 L=6
20110 GOSUB 18000
20120 END
```

TABLE OF VARIABLES

BA

1010	4200	4390	4420	4730	4730
5070	5550	5550	5630	7010	7020
7020	11010	11030	20060	20080	

WA

1020	4030	4610	4620	4690	5130
5150	5670	5670	6280	6280	6870
11010					

S$

1030	2310	4310	4320	5230	5730

SF$

1030	5570	6810	6820	6830

WF$

1030	5560	6700	6710	6720	6730

WP$

1030	4140	5050	6400	6460	6520
6580					

L

2010	2040	2080	2290	4040	4070
4150	5010	5210	5710	18010	20010
20100					

DE

2060	4090	4170	19010

DA
4010 4010 4020 4060 5030

P
4230 4250 4250 5170 5540 6020
6040 6060 6070 6070 6080 6080
6090 6090 6100 6100 6110

MM
4280 4380 5090 5620 5640 5640
5680 6880 7030 7030

SA
4350 4370 4550 4560 4570 6140
7010 7020 7030 7040

TT
4430 4720 4720 5650

UN
4590 4700 6150 6170 6190 6210
6230 6250 6270 6280 6300

TL
4720 4730 6150 6190 6230 6270
11010 11030 11050 11060

IC
5540 5550 5600

VW
5540 5580 5590 5610 5640 6900
6920 6930 6940

VI
5590 5670 6860 6890 6920

PF
6060 6070 6080 6090 6100 6110
6860

AF
6170 6170 6210 6210 6250 6250
6300 6300 6860

N
6330 6760 10010

R
6350 6360 6360 6370 6370 6380
6660 6670 6670 6680 6680 6690
6780 6790 6790 6800 10010

WP
6350 6360 6370 6380 6390

A
```
   6410   6470   6530   6590   6660   6670
   6670   6680   6680   6690
```

B
```
   6420   6480   6540   6600   6670   6680
   6680   6690
```

C
```
   6430   6490   6550   6610   6680   6690
```

D
```
   6440   6500   6560   6620
```

WF
```
   6660   6670   6680   6690   6700   6710
   6720   6730   6860
```

SF
```
   6780   6790   6800   6810   6820   6830
   6860
```

VM
```
   6870   6890   6900
```

ML
```
   6880   6930   6940
```

I
```
   18010  18030  19010  19020
```


PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   CAR WASH BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM   INITIALIZATION
1010 BA = 25.00
1020 WA = 5
1030 REM USE FULL SCREEN
1040 POKE 82,0
1050 CLS
2000 REM   INTRODUCTION
2010 L = 24
2020 GOSUB 18000
2030 PRINT "               CAR WASH!"
2040 L = 12
2050 GOSUB 18000
2060 DE = 1500
2070 GOSUB 19000
2080 L = 24
2090 GOSUB 18000
2100 PRINT "YOU ARE GOING TO START A CAR WASH!"
2110 PRINT
```

```
2120 PRINT "YOU WILL RUN IT FOR FIVE DAYS"
2130 PRINT "WITH THE SOLE OBJECT BEING TO MAKE"
2140 PRINT "AS MUCH MONEY AS POSSIBLE!"
2150 PRINT
2160 PRINT "YOU WILL HAVE A TOTAL OF 5 WORKERS,"
2170 PRINT "EACH OF WHOM CAN WASH A MAXIMUM OF"
2180 PRINT "20 CARS DURING THE DAY."
2190 PRINT
2200 PRINT "AS YOU WILL SEE, THERE ARE A"
2210 PRINT "NUMBER OF FACTORS YOU MUST CONSIDER,"
2220 PRINT "BUT BY ALL MEANS, YOU NEED TO WATCH"
2230 PRINT "THE WEATHER FORECASTS, SINCE RAINY"
2240 PRINT "WEATHER WILL DO YOU IN!"
2250 PRINT
2260 PRINT "THE ONLY WAY TO LEARN IS BY DOING,SO"
2270 PRINT "WHEN YOU ARE READY, PUSH THE"
2280 PRINT "'RETURN' KEY."
2290 L = 3
2300 GOSUB 18000
2310 INPUT S$
4000 REM  MAIN PROGRAM
4010 DA = DA + 1
4020 IF DA = 6 THEN 20000
4030 WA = 5
4040 L = 24
4050 GOSUB 18000
4060 PRINT "TODAY IS DAY NUMBER ";DA;"."
4070 L = 6
4080 GOSUB 18000
4090 DE = 1500
4100 GOSUB 19000
4110 GOSUB 6320
4120 PRINT
4130 PRINT "THE WEATHER FORECAST IS:"
4140 PRINT WP$
4150 L = 12
4160 GOSUB 18000
4170 DE = 2000
4180 GOSUB 19000
4190 GOSUB 18000
4200 PRINT "YOU HAVE A BALANCE OF ";BA;" DOLLARS."
4210 PRINT
4220 PRINT "WHAT PRICE ARE YOU GOING TO CHARGE";
4230 INPUT P
4240 GOSUB 6010
4250 IF P < .26 OR P > 4.49 THEN 4220
4260 PRINT
4270 PRINT "IT COSTS ABOUT .25 PER CAR FOR MATERIALS"
4280 PRINT "PRESENTLY YOU HAVE ";MM;" DOLLARS"
4290 PRINT "WORTH OF SOAP,SPONGES,RAGS,ETC."
4300 PRINT "DO YOU WISH TO ADD TO THIS (YES OR NO)"
4310 INPUT S$
4320 IF S$ = "NO" THEN 4400
4330 PRINT
4340 PRINT "ENTER THE AMOUNT YOU WANT TO ADD."
4350 INPUT SA
```

```
4360 GOSUB 7000
4370 IF SA > 0 THEN 4340
4380 PRINT "YOU NOW HAVE $";MM;" WORTH OF MATERIALS."
4390 PRINT "AND A BALANCE OF $";BA
4400 PRINT
4410 REM
4420 PRINT "BALANCE = $";BA
4430 PRINT "AMOUNT SPENT ON ADVERTISING = $";TT
4440 PRINT "YOU HAVE A CHOICE OF THE FOLLOWING"
4450 PRINT "FORMS OF ADVERTISING:"
4460 PRINT
4470 PRINT "   MEDIUM    COST PER UNIT"
4480 PRINT
4490 PRINT "1. RADIO          $20.00"
4500 PRINT "2. NEWSPAPER       $5.00"
4510 PRINT "3. POSTERS         $1.00"
4520 PRINT "4. KIDS AT CURB   $1.00"
4530 PRINT
4540 PRINT "PICK A NUMBER (OR 0 FOR NONE)."
4550 INPUT SA
4560 IF SA = 0 THEN 4750
4570 IF SA = 4 THEN 4610
4580 PRINT "HOW MANY UNITS?"
4590 INPUT UN
4600 GOSUB 4710
4610 PRINT "YOU NOW HAVE ";WA;" KIDS TO WASH CARS"
4620 PRINT "AND ";5 - WA;" KIDS AT THE CURB"
4630 PRINT "WAVING CARS IN.  EACH KID AT THE CURB"
4640 PRINT "HAS A POSTER ($1.00) AND A BIG SMILE,"
4650 PRINT "********BUT THEY CAN'T WASH CARS !******"
4660 PRINT
4670 PRINT "HOW MANY OF YOUR 5 KIDS DO YOU WANT AT"
4680 PRINT "THE CURB?"
4690 WA = 5
4700 INPUT UN
4710 GOSUB 6130
4720 TT = TT + TL
4730 BA = BA - TL
4740 GOTO 4410
4750 REM
5000 REM  LIST VARIABLES
5010 L = 24
5020 GOSUB 18000
5030 PRINT " SUMMARY FOR START OF DAY ";DA
5040 PRINT
5050 PRINT "WEATHER FORECAST: ";WP$
5060 PRINT
5070 PRINT "CASH ON HAND : $";BA
5080 PRINT
5090 PRINT "CASH VALUE OF CAR WASH SUPPLIES : $";MM
5120 PRINT
5130 PRINT "NUMBER OF 'CURB KIDS': ";5 - WA
5140 PRINT
5150 PRINT "NUMBER OF CAR WASHERS: ";WA
5160 PRINT
5170 PRINT "PRICE PER CAR: $";P
```

```
5180 PRINT
5190 PRINT "PRESS 'RETURN'"
5200 PRINT "TO GET THE DAY GOING!"
5210 L = 3
5220 GOSUB 18000
5230 INPUT S$
5500 REM   WASH CARS!
5510 GOSUB 6640
5520 GOSUB 6750
5530 GOSUB 6850
5540 IC = P * VW
5550 BA = BA + IC
5560 PRINT "WEATHER: ";WF$
5570 PRINT "TRAFFIC: ";SF$
5580 PRINT "VEHICLES WASHED: ";VW
5590 PRINT "VEHICLES NOT WASHED: ";VI - VW
5600 PRINT "INCOME: $";IC
5610 PRINT "COST OF MATERIALS USED: $";VW * .25
5620 PRINT "MATERIALS STARTED WITH: $";MM
5630 PRINT "BALANCE ON HAND: $";BA
5640 MM = MM - (VW * .25)
5650 TT = 0
5660 PRINT
5670 IF VI > WA * 20 THEN  PRINT "TOO MANY CARS FOR ";WA;" W
ASHERS!"
5680 IF MM < .25 THEN  PRINT "OUT OF SUPPLIES!"
5690 PRINT
5700 PRINT "PRESS 'RETURN' TO CONTINUE."
5710 L = 6
5720 GOSUB 18000
5730 INPUT S$
5740 GOTO 4000
6000 REM   CALCULATIONS
6010 REM   PRICE FACTOR
6020 IF P < 4.50 THEN 6040
6030 PRINT "YOUR PRICE IS TOO HIGH!"
6040 IF P > .25 THEN 6060
6050 PRINT "YOUR PRICE IS TOO LOW!"
6060 IF P < .76 THEN PF = 2.0
6070 IF P > .75 AND P < 1.26 THEN PF = 1.5
6080 IF P > 1.25 AND P < 1.76 THEN PF = 1.0
6090 IF P > 1.75 AND P < 2.51 THEN PF = .75
6100 IF P > 2.50 AND P < 3.51 THEN PF = .50
6110 IF P > 3.50 THEN PF = .25
6120 RETURN
6130 REM   ADVERTISING FACTOR
6140 ON SA GOTO 6150,6190,6230,6270
6150 TL = 20 * UN
6160 GOSUB 11000
6170 AF = AF + .10 * UN
6180 RETURN
6190 TL = 5 * UN
6200 GOSUB 11000
6210 AF = AF + .05 * UN
6220 RETURN
6230 TL = 1 * UN
```

```
6240 GOSUB 11000
6250 AF = AF + .02 * UN
6260 RETURN
6270 TL = 1 * UN
6280 WA = WA - UN
6290 GOSUB 11000
6300 AF = AF + .2 * UN
6310 RETURN
6320 REM   WEATHER PREDICTION
6330 N = 100
6340 GOSUB 10000
6350 IF R < 31 THEN WP = 1
6360 IF R > 30 AND R < 61 THEN WP = 2
6370 IF R > 60 AND R < 86 THEN WP = 3
6380 IF R > 85 THEN WP = 4
6390 ON WP GOTO 6400,6460,6520,6580
6400 WP$ = "10% CHANCE OF RAIN"
6410 A = 50
6420 B = 30
6430 C = 10
6440 D = 10
6450 RETURN
6460 WP$ = "25% CHANCE OF RAIN"
6470 A = 30
6480 B = 35
6490 C = 20
6500 D = 15
6510 RETURN
6520 WP$ = "50% CHANCE OF RAIN"
6530 A = 15
6540 B = 20
6550 C = 30
6560 D = 35
6570 RETURN
6580 WP$ = "90% CHANCE OF RAIN"
6590 A = 5
6600 B = 10
6610 C = 20
6620 D = 65
6630 RETURN
6640 REM   ACTUAL WEATHER
6650 GOSUB 10000
6660 IF R < A + 1 THEN WF = 1.5
6670 IF R > A AND R < A + B + 1 THEN WF = 1
6680 IF R > A + B AND R < A + B + C + 1 THEN WF = .5
6690 IF R > A + B + C THEN WF = .001
6700 IF WF = 1.5 THEN WF$ = "HOT AND SUNNY"
6710 IF WF = 1 THEN WF$ = "PARTLY SUNNY"
6720 IF WF = .5 THEN WF$ = "CLOUDY"
6730 IF WF = .001 THEN WF$ = "RAIN!"
6740 RETURN
6750 REM   STREET FACTOR
6760 N = 10
6770 GOSUB 10000
6780 IF R < 4 THEN SF = 1.3
6790 IF R > 3 AND R < 10 THEN SF = 1
```

```
6800 IF R = 10 THEN SF = .5
6810 IF SF = 1.3 THEN SF$ = "HEAVY TRAFFIC"
6820 IF SF = 1 THEN SF$ = "AVERAGE TRAFFIC"
6830 IF SF = .5 THEN SF$ = "STREET REPAIRS!"
6840 RETURN
6850 REM   BUSINESS FOR DAY
6860 VI =   INT (50 * PF * (AF + 1) * WF * SF)
6870 VM = WA * 20
6880 ML = MM / .25
6890 IF VI < VM THEN 6920
6900 VW = VM
6910 GOTO 6950
6920 VW = VI
6930 IF VW < ML THEN 6950
6940 VW = ML
6950 RETURN
7000 REM   ADD TO MATERIALS
7010 IF SA > BA GOTO 7060
7020 BA = BA - SA
7030 MM = MM + SA
7040 SA = 0
7050 RETURN
7060 PRINT "THAT'S MORE THAN YOU HAVE!"
7070 RETURN
10000 REM     RANDOMIZATION
10010 R =   RND(N)
10020 RETURN
11000 REM  CHECK BALANCE
11010 IF TL > BA OR WA < 1 THEN 11030
11020 RETURN
11030 IF TL > BA GOTO 11050
11040 GOTO 11080
11050 PRINT "YOU DON'T HAVE $";TL;"!"
11060 TL = 0
11070 GOTO 4400
11080 PRINT "THERE'S NO ONE LEFT TO WASH CARS!"
11090 GOTO 4610
18000 REM  SCROLLING
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM  DELAY
19010 FOR I = 1 TO DE
19020 NEXT I
19030 RETURN
20000 REM  CLOSING
20010 L = 24
20020 GOSUB 18000
20030 PRINT "YOUR 5 DAYS ARE OVER!"
20040 PRINT
20050 PRINT "YOU HAVE ACCUMULATED A TOTAL OF "
20060 PRINT BA;" DOLLARS!"
20070 PRINT "DIVIDED 5 WAYS (REMEMBER YOUR 4"
20080 PRINT "PARTNERS), THAT MAKES ";BA / 5;" DOLLARS"
20090 PRINT "PER PERSON!"
```

```
20100 L = 6
20110 GOSUB 18000
20120 END
```

TABLE OF VARIABLES

```
A - WEATHER FACTOR
6410 6470 6530 6590 6660 6670
6670 6680 6680 6690

AF - ADVERTISING FACTOR
6170 6170 6210 6210 6250 6250
6300 6300 6860

B - WEATHER FACTOR
6420 6480 6540 6600 6670 6680
6680 6690

BA - BALANCE ON HAND
1010 4200 4390 4420 4730 4730
5070 5550 5550 5630 7010 7020
7020 11010 11030 20060 20080

C - WEATHER FACTOR
6430 6490 6550 6610 6680 6690

D - WEATHER FACTOR
6440 6500 6560 6620

DA - DAY NUMBER
4010 4010 4020 4060 5030

DE - DELAY
2060 4090 4170 19010

I - COUNTER
18010 18030 19010 19020

IC - INCOME
5540 5550 5600

L - LINES FOR SCROLLING
2010 2040 2080 2290 4040 4070
4150 5010 5210 5710 18010 20010
20100

ML - MATERIALS LIMIT
6880 6930 6940

MM - MATERIALS STARTED WITH
4280 4380 5090 5620 5640 5640
5680 6880 7030 7030

N - MAXIMUM RANDOM NUMBER
6330 6760 10010
```

P — PRICE PER WASH
4230 4250 4250 5170 5540 6020
6040 6060 6070 6070 6080 6080
6090 6090 6100 6100 6110

PF — PRICE FACTOR
6060 6070 6080 6090 6100 6110
6860

R — RANDOM NUMBER
6350 6360 6360 6370 6370 6380
6660 6670 6670 6680 6680 6690
6780 6790 6790 6800 10010

S$ — STUDENT ANSWER
2310 4310 4320 5230 5730

SA — STUDENT ANSWER
4350 4370 4550 4560 4570 6140
7010 7020 7030 7040

SF — STREET (TRAFFIC) FACTOR
6780 6790 6800 6810 6820 6830
6860

SF$ — STREET MESSAGE
5570 6810 6820 6830

TL — COST OF ADVERTISING AS SELECTED
4720 4730 6150 6190 6230 6270
11010 11030 11050 11060

TT — TOTAL ADVERTISING BUDGET FOR DAY
4430 4720 4720 5110 5650

UN — UNITS OF EACH AD TECHNIQUE
4590 4700 6150 6170 6190 6210
6230 6250 6270 6280 6300

VI — VEHICLES ENTERING
5590 5670 6860 6890 6920

VM — MAXIMUM NO. OF VEHICLES WHICH COULD BE WASHED
6870 6890 6900

VW — VEHICLES ACTUALLY WASHED
5540 5580 5590 5610 5640 6900
6920 6930 6940

WA — NUMBER OF CAR WASHERS
1020 4030 4610 4620 4690 5130
5150 5670 5670 6280 6280 6870
11010

WF — ACTUAL WEATHER FACTOR
6660 6670 6680 6690 6700 6710

6720 6730 6860

WF$ - WEATHER MESSAGE
5560 6700 6710 6720 6730

WP - WEATHER PREDICTION
6350 6360 6370 6380 6390

WP$ - WEATHER PREDICTION MESSAGE
4140 5050 6400 6460 6520 6580

END OF VAR. LIST

SAMPLE RUN

YOU ARE GOING TO START A CAR WASH!

YOU WILL RUN IT FOR FIVE DAYS
WITH THE SOLE OBJECT BEING TO MAKE
AS MUCH MONEY AS POSSIBLE!

YOU WILL HAVE A TOTAL OF 5 WORKERS,
EACH OF WHOM CAN WASH A MAXIMUM OF
20 CARS DURING THE DAY.

AS YOU WILL SEE, THERE ARE A
NUMBER OF FACTORS YOU MUST CONSIDER,
BUT BY ALL MEANS, YOU NEED TO WATCH
THE WEATHER FORECASTS, SINCE RAINY
WEATHER WILL DO YOU IN!

THE ONLY WAY TO LEARN IS BY DOING,SO
WHEN YOU ARE READY, PUSH THE 'RETURN'
KEY.

?

TODAY IS DAY NUMBER 1.

THE WEATHER FORECAST IS:
25% CHANCE OF RAIN

YOU HAVE A BALANCE OF 25 DOLLARS.

WHAT PRICE ARE YOU GOING TO CHARGE?2.00

IT COSTS ABOUT .25 PER CAR FOR MATERIALS
PRESENTLY YOU HAVE 0 DOLLARS
WORTH OF SOAP,SPONGES,RAGS,ETC.
DO YOU WISH TO ADD TO THIS (YES OR NO)
?YES

ENTER THE AMOUNT YOU WANT TO ADD.

?15.00
YOU NOW HAVE $15 WORTH OF MATERIALS.
AND A BALANCE OF $10

BALANCE = $10
AMOUNT SPENT ON ADVERTISING = $0
YOU HAVE A CHOICE OF THE FOLLOWING
FORMS OF ADVERTISING:

    MEDIUM   COST PER UNIT

1. RADIO $20.00
2. NEWSPAPER $5.00
3. POSTERS $1.00
4. KIDS AT CURB $1.00

PICK A NUMBER (OR 0 FOR NONE).
?2
HOW MANY UNITS?
?1
BALANCE = $5
AMOUNT SPENT ON ADVERTISING = $5
YOU HAVE A CHOICE OF THE FOLLOWING
FORMS OF ADVERTISING:

    MEDIUM   COST PER UNIT

1. RADIO $20.00
2. NEWSPAPER $5.00
3. POSTERS $1.00
4. KIDS AT CURB $1.00

PICK A NUMBER (OR 0 FOR NONE).
?3
HOW MANY UNITS?
?5
BALANCE = $0
AMOUNT SPENT ON ADVERTISING = $10
YOU HAVE A CHOICE OF THE FOLLOWING
FORMS OF ADVERTISING:

    MEDIUM   COST PER UNIT

1. RADIO $20.00
2. NEWSPAPER $5.00
3. POSTERS $1.00
4. KIDS AT CURB $1.00

PICK A NUMBER (OR 0 FOR NONE).
?0

  SUMMARY FOR START OF DAY 1

WEATHER FORECAST: 25% CHANCE OF RAIN

CASH ON HAND : $0

```
CASH VALUE OF CAR WASH SUPPLIES : $15

ADVERTISING BUDGET FOR TODAY: $10

NUMBER OF 'CURB KIDS': 0

NUMBER OF CAR WASHERS: 5

PRICE PER CAR: $2

PRESS 'RETURN'
TO GET THE DAY GOING!

?
WEATHER: HOT AND SUNNY
TRAFFIC: AVERAGE TRAFFIC
VEHICLES WASHED: 60
VEHICLES NOT WASHED: 4
INCOME: $120
COST OF MATERIALS USED: $15
MATERIALS STARTED WITH: $15
BALANCE ON HAND: $120

OUT OF SUPPLIES!

PRESS 'RETURN' TO CONTINUE.

?

TODAY IS DAY NUMBER 2.
```

Check-Out Counter

PROGRAM DESCRIPTION

This program roughly simulates some of the things you would do at a department store check-out counter. The computer scrolls a number of prices and you must simulate the operation of a cash register by entering the prices into the computer one at a time. You must enter the correct prices and give the right amount of change at the end of the check-out or you will have a great number of angry customers! As you proceed, the prices will move faster and faster to help you increase your efficiency. The faster you can go without making any errors the higher your pay will be.

PROGRAM NOTES

1. It might be more effective to "flash" the numbers by clearing the screen, printing the number, pausing, then clearing the screen again.

2. Computers usually do a terrible job of sticking to precisely two decimal places as required by money amounts. The Microsoft BASIC has a sure cure for this if you investigate the PRINT USING command. For the ATARI BASIC, consider writing a "Mighty Money Maker" subroutine through which all money values would pass. The main problem areas are in the printing of 3.4 dollars instead of 3.40, or printing 3.4000001 dollars instead of 3.40. Good luck!

```
100 REM CHECK-OUT COUNTER BY GARY ORWIG
1000 REM INITIALIZATION - 'MX' IS MAXIMUM OF VALUES DISPLAYE
D.
1010 MX=10
1020 DIM R$(15),SA$(15)
1030 REM USE FULL SCREEN
1040 POKE 82,0
1050 PRINT
2000 REM INTRODUCTION
2010 L=24
2020 GOSUB 18000
2030 FOR J=1 TO 10
2040 PRINT "           CHECK - OUT COUNTER"
2050 L=12
2060 GOSUB 18000
2070 D=25
2080 GOSUB 19000
2090 NEXT J
2100 PRINT "THIS PROGRAM ROUGHLY SIMULATES SOME OF"
2110 PRINT "THE THINGS YOU WOULD DO AT A DEPARTMENT"
2120 PRINT "STORE CHECK OUT COUNTER."
2130 PRINT
2140 PRINT "YOU WILL SEE A BUNCH OF PRICES, AND"
2150 PRINT "TYPE THEM ONE AT A TIME INTO THE "
2160 PRINT "COMPUTER.  YOU MUST TYPE THEM IN"
2170 PRINT "ACCURATELY, OR YOU WILL HAVE ANGRY"
2180 PRINT "CUSTOMERS AFTER YOU!"
2190 PRINT
2200 PRINT "AFTER TYPING IN ALL THE PRICES, YOU"
2210 PRINT "WILL RING UP A TOTAL, BE GIVEN CASH,"
2220 PRINT "AND MAKE THE CORRECT CHANGE."
2230 PRINT "ONCE AGAIN, YOU MUST BE ACCURATE!"
2240 PRINT
2250 PRINT "AS YOU PROCEED, THE PRICES WILL MOVE"
2260 PRINT "FASTER AND FASTER.  THE FASTER YOU CAN"
2270 PRINT "GO WITHOUT MISTAKES, THE HIGHER YOUR"
2280 PRINT "PAY WILL BE!"
2290 PRINT
2300 PRINT "PUSH 'RETURN' TO START."
2310 INPUT SA$
3000 REM EXAMPLE
3010 GOSUB 18000
3020 PRINT "YOU WILL SEE A PRICE, LIKE THIS:"
3030 GOSUB 18000
3040 D=200
3050 GOSUB 19000
3060 GOSUB 18000
3070 GOSUB 10000
3080 PRINT "           ";R$
3090 GOSUB 18000
3100 D=40
3110 GOSUB 19000
3120 L=24
3130 GOSUB 18000
```

```
3140 PRINT "AS SOON AS THE PRICE DISAPPEARS, TYPE"
3150 PRINT "IT IN AND PUSH 'RETURN'."
3160 INPUT SA$
3170 IF SA$=R$ THEN PRINT "VERY GOOD!"
3180 D=200
3190 GOSUB 19000
3200 GOSUB 18000
3210 PRINT "          HERE WE GO!"
3220 L=12
3230 GOSUB 18000
3240 GOSUB 19000
3250 D=60
3260 MX=10
4000 REM MAIN PROGRAM
4010 IF D<10 THEN 20000
4020 GOSUB 10000
4030 L=12
4040 GOSUB 18000
4050 PRINT "                    ";R$
4060 GOSUB 18000
4070 GOSUB 19000
4080 GOSUB 18000
4090 INPUT SA
4100 GOSUB 11000
4110 GOTO 4000
4120 PRINT "PUSH 'RETURN' TO GET"
4130 PRINT "THE TOTAL."
4140 INPUT SA$
4150 PRINT "YOUR TOTAL IS ";SS
4160 REM CALCULATE PAYMENT
4170 PA=PA+10
4180 IF PA>SS THEN 4200
4190 GOTO 4170
4200 PRINT
4210 PRINT
4220 PRINT "THE CUSTOMER PAYS YOU WITH ";PA
4230 PRINT "DOLLARS."
4240 PRINT
4250 CC=PA-SS
4260 CC=INT(CC*100+0.5)/100
4270 PRINT "THE REQUIRED CHANGE IS ";CC
4280 PRINT "DOLLARS."
4290 PRINT
4300 PRINT
4310 PRINT "CHANGE BACK:"
4320 PRINT
4330 PRINT "HOW MANY 'FIVES'?"
4340 INPUT SA
4350 SC=SA*5+SC
4360 PRINT "HOW MANY 'ONES'?"
4370 INPUT SA
4380 SC=SA+SC
4390 PRINT "HOW MANY 'QUARTERS'?"
4400 INPUT SA
4410 SC=SA*0.25+SC
4420 PRINT "HOW MANY 'DIMES'?"
```

```
4430 INPUT SA
4440 SC=SA*0.1+SC
4450 PRINT "HOW MAY 'NICKLES'?"
4460 INPUT SA
4470 SC=SA*0.05+SC
4480 PRINT "HOW MANY 'PENNIES'?"
4490 INPUT SA
4500 SC=SA*0.01+SC
4510 PRINT
4520 PRINT "YOU GAVE THE CUSTOMER ";SC
4530 PRINT "DOLLARS CHANGE."
4540 CC=INT(CC*100+0.5)/100
4550 SC=INT(SC*100+0.5)/100
4560 IF CC=SC THEN 4710
4570 PRINT "THE CASH REGISTER SHOWS THAT YOU SHOULD"
4580 PRINT "HAVE PAID BACK ";CC;" DOLLARS!"
4590 IF CC>SC THEN 4650
4600 PRINT "CUSTOMER GOES AWAY HAPPY!!"
4610 PRINT "BUT YOUR PAY WILL BE DOCKED!"
4620 D=D+10
4630 PRINT
4640 GOTO 5000
4650 PRINT "ANGRY CUSTOMER WANTS MANAGER!!"
4660 PRINT
4670 PRINT "MANAGER SMOOTHS THINGS OUT, BUT HE"
4680 PRINT "IS SURE MAD AT YOU!"
4690 D=D+10
4700 GOTO 5000
4710 PRINT "GOOD GOING!"
4720 D=D-10
5000 REM SPOT CHECK TOTAL
5010 PRINT " A SPOT CHECK OF THE PURCHASES"
5020 PRINT "SHOWS THE CORRECT TOTAL IS: ";CT
5030 PRINT "DOLLARS."
5040 PRINT "YOUR TOTAL WAS: ";SS
5050 PRINT "DOLLARS."
5060 CT=INT(CT*100+0.5)/100
5070 SS=INT(SS*100+0.5)/100
5080 IF CT=SS THEN 5220
5090 IF CT>SS THEN 5160
5100 PRINT "YOU OVER CHARGED THE CUSTOMER "
5110 DF=INT((SS-CT)*100+0.5)/100
5120 PRINT DF;" DOLLARS"
5130 PRINT "BECAUSE YOU KEYED IN THE PRICES WRONG!"
5140 D=D+10
5150 GOTO 6000
5160 PRINT "THE STORE LOST"
5170 DF=INT((CT-SS)*100+0.5)/100
5180 PRINT DF;" DOLLARS BECAUSE"
5190 PRINT "YOU KEYED IN THE PRICES WRONG!"
5200 D=D+10
5210 GOTO 6000
5220 PRINT "GOOD GOING!"
5230 D=D-10
6000 REM GO AGAIN?
6010 PA=INT(120-D)/20
```

```
6020 PRINT
6030 PRINT "YOUR PRESENT PAY IS ";PA
6040 PRINT "DOLLARS PER HOUR."
6050 PRINT
6060 PRINT "WOULD YOU LIKE TO GO AGAIN?"
6070 PRINT "(YES OR NO)"
6080 INPUT SA$
6090 IF SA$="NO" THEN 20060
6100 REM RESET
6110 PA=0
6120 CT=0
6130 SS=0
6140 SA=0
6150 CC=0
6160 SC=0
6170 DF=0
6180 PB=0
6190 PRINT
6200 PRINT "PRESS 'RETURN' TO START."
6210 INPUT SA$
6220 GOTO 4000
10000 REM RANDOMIZATION
10010 R=RND(0)*MX
10020 R$=STR$(R)
10030 FOR I=1 TO LEN(R$)
10040 IF R$(I,I)<>"." THEN NEXT I
10050 IF I+2>LEN(R$) THEN 10000
10060 R$=R$(1,I+2)
10070 RETURN
11000 REM JUDGE ANSWER
11010 CT=CT+VAL(R$)
11020 SS=SS+SA
11030 PB=PB+1
11040 IF PB=11 THEN 4120
11050 RETURN
18000 REM SCROLLING
18010 FOR I=1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM DELAY
19010 FOR I=1 TO D
19020 NEXT I
19030 RETURN
20000 REM CLOSE
20010 PRINT "YOU ARE A SUPER WHIZ AT THE CHECKOUT"
20020 PRINT "COUNTER!  YOU MAY RETIRE WITH FULL"
20030 PRINT "BENIFITS!"
20040 PRINT
20050 PRINT "BYE!"
20060 END
```

TABLE OF VARIABLES

```
MX
    1010   3260   10010
```

R$
    1020   3080   3170   4050   10020   10030
    10040   10050   10060   10060   11010

SA$
    1020   2310   3160   3170   4140   6080
    6090   6210

L
    2010   2050   3120   3220   4030   18010

J
    2030   2090

D
    2070   3040   3100   3180   3250   4010
    4620   4620   4690   4690   4720   4720
    5140   5140   5200   5200   5230   5230
    6010   19010

SA
    4090   4340   4350   4370   4380   4400
    4410   4430   4440   4460   4470   4490
    4500   6140   11020

SS
    4150   4180   4250   5040   5070   5070
    5080   5090   5110   5170   6130   11020
    11020

PA
    4170   4170   4180   4220   4250   6010
    6030   6110

CC
    4250   4260   4260   4270   4540   4540
    4560   4580   4590   6150

SC
    4350   4350   4380   4380   4410   4410
    4440   4440   4470   4470   4500   4500
    4520   4550   4550   4560   4590   6160

CT
    5020   5060   5060   5080   5090   5110
    5170   6120   11010   11010

DF
    5110   5120   5170   5180   6170

PB
    6180   11030   11030   11040

R
    10010   10020

I
```
     10030 10040 10040 10040 10050 10060
     18010 18030 19010 19020
```

PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   CHECK-OUT COUNTER BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM   INITIALIZATION - 'MX' IS MAXIMUM OF VALUES DISPLAY
ED.
1010 MX = 10
1020 REM USE FULL SCREEN
1030 POKE 82,0
1040 CLS
2000 REM   INTRODUCTION
2010 L = 24
2020 GOSUB 18000
2030 FOR J = 1 TO 10
2040 PRINT "            CHECK - OUT COUNTER"
2050 L = 12
2060 GOSUB 18000
2070 D = 250
2080 GOSUB 19000
2090 NEXT J
2100 PRINT "THIS PROGRAM ROUGHLY SIMULATES SOME OF"
2110 PRINT "THE THINGS YOU WOULD DO AT A DEPARTMENT"
2120 PRINT "STORE CHECK OUT COUNTER."
2130 PRINT
2140 PRINT "YOU WILL SEE A BUNCH OF PRICES, AND"
2150 PRINT "TYPE THEM ONE AT A TIME INTO THE "
2160 PRINT "COMPUTER.  YOU MUST TYPE THEM IN"
2170 PRINT "ACCURATELY, OR YOU WILL HAVE ANGRY"
2180 PRINT "CUSTOMERS AFTER YOU!"
2190 PRINT
2200 PRINT "AFTER TYPING IN ALL THE PRICES, YOU"
2210 PRINT "WILL RING UP A TOTAL, BE GIVEN CASH,"
2220 PRINT "AND MAKE THE CORRECT CHANGE."
2230 PRINT "ONCE AGAIN, YOU MUST BE ACCURATE!"
2240 PRINT
2250 PRINT "AS YOU PROCEED, THE PRICES WILL MOVE"
2260 PRINT "FASTER AND FASTER.  THE FASTER YOU CAN"
2270 PRINT "GO WITHOUT MISTAKES, THE HIGHER YOUR"
2280 PRINT "PAY WILL BE!"
2290 PRINT
2300 PRINT "PUSH 'RETURN' TO CONTINUE."
2310 INPUT SA$
3000 REM   EXAMPLE
3010 GOSUB 18000
3020 PRINT "YOU WILL SEE A PRICE, LIKE THIS:"
3030 GOSUB 18000
3040 D = 1000
3050 GOSUB 19000
3060 GOSUB 18000
3070 GOSUB 10000
3080 PRINT "                    ";R$
```

```
3090 GOSUB 18000
3100 D = 200
3110 GOSUB 19000
3120 L = 24
3130 GOSUB 18000
3140 PRINT "AS SOON AS THE PRICE DISAPPEARS, TYPE"
3150 PRINT "IT IN AND PUSH 'RETURN'."
3160 INPUT SA$
3170 IF SA$ = R$ THEN  PRINT "VERY GOOD!"
3180 D = 1000
3190 GOSUB 19000
3200 GOSUB 18000
3210 PRINT "          HERE WE GO!"
3220 L = 12
3230 GOSUB 18000
3240 GOSUB 19000
3250 D = 300
3260 MX = 10
4000 REM  MAIN PROGRAM
4010 IF D < 50 THEN 20000
4020 GOSUB 10000
4030 L = 12
4040 GOSUB 18000
4050 PRINT "                ";R$
4060 GOSUB 18000
4070 GOSUB 19000
4080 GOSUB 18000
4090 INPUT SA
4100 GOSUB 11000
4110 GOTO 4000
4120 PRINT "PUSH 'RETURN' TO GET"
4130 PRINT "THE TOTAL."
4140 INPUT SA$
4150 PRINT "YOUR TOTAL IS ";SS
4160 REM  CALCULATE PAYMENT
4170 PA = PA + 10
4180 IF PA > SS THEN 4200
4190 GOTO 4170
4200 PRINT
4210 PRINT
4220 PRINT "THE CUSTOMER PAYS YOU WITH ";PA
4230 PRINT "DOLLARS."
4240 PRINT
4250 CC = PA - SS
4260 CC =  INT (CC * 100 + .5) / 100
4270 PRINT "THE REQUIRED CHANGE IS ";CC
4280 PRINT "DOLLARS."
4290 PRINT
4300 PRINT
4310 PRINT "CHANGE BACK:"
4320 PRINT
4330 PRINT "HOW MANY 'FIVES'?"
4340 INPUT SA
4350 SC = SA * 5 + SC
4360 PRINT "HOW MANY 'ONES'?"
4370 INPUT SA
```

```
4380 SC = SA + SC
4390 PRINT "HOW MANY 'QUARTERS'?"
4400 INPUT SA
4410 SC = SA * .25 + SC
4420 PRINT "HOW MANY 'DIMES'?"
4430 INPUT SA
4440 SC = SA * .10 + SC
4450 PRINT "HOW MAY 'NICKLES'?"
4460 INPUT SA
4470 SC = SA * .05 + SC
4480 PRINT "HOW MANY 'PENNIES'?"
4490 INPUT SA
4500 SC = SA * .01 + SC
4510 PRINT
4520 PRINT "YOU GAVE THE CUSTOMER ";SC
4530 PRINT "DOLLARS CHANGE."
4540 CC =   INT (CC * 100 + .5) / 100
4550 SC =   INT (SC * 100 + .5) / 100
4560 IF CC = SC THEN 4710
4570 PRINT "THE CASH REGISTER SHOWS THAT YOU SHOULD"
4580 PRINT "HAVE PAID BACK ";CC;" DOLLARS!"
4590 IF CC > SC THEN 4650
4600 PRINT "CUSTOMER GOES AWAY HAPPY!!"
4610 PRINT "BUT YOUR PAY WILL BE DOCKED!"
4620 D = D + 50
4630 PRINT
4640 GOTO 5000
4650 PRINT "ANGRY CUSTOMER WANTS MANAGER!!"
4660 PRINT
4670 PRINT "MANAGER SMOOTHS THINGS OUT, BUT HE"
4680 PRINT "IS SURE MAD AT YOU!"
4690 D = D + 50
4700 GOTO 5000
4710 PRINT "GOOD GOING!"
4720 D = D - 50
5000 REM   SPOT CHECK TOTAL
5010 PRINT " A SPOT CHECK OF THE PURCHASES"
5020 PRINT "SHOWS THE CORRECT TOTAL IS: ";CT
5030 PRINT "DOLLARS."
5040 PRINT "YOUR TOTAL WAS: ";SS
5050 PRINT "DOLLARS."
5060 CT =   INT (CT * 100 + .5) / 100
5070 SS =   INT (SS * 100 + .5) / 100
5080 IF CT = SS THEN 5220
5090 IF CT > SS THEN 5160
5100 PRINT "YOU OVER CHARGED THE CUSTOMER "
5110 DF =   INT ((SS - CT) * 100 + .5) / 100
5120 PRINT DF;" DOLLARS"
5130 PRINT "BECAUSE YOU KEYED IN THE PRICES WRONG!"
5140 D = D + 50
5150 GOTO 6000
5160 PRINT "THE STORE LOST"
5170 DF =   INT ((CT - SS) * 100 + .5) / 100
5180 PRINT DF;" DOLLARS BECAUSE"
5190 PRINT "YOU KEYED IN THE PRICES WRONG!"
5200 D = D + 50
```

```
5210 GOTO 6000
5220 PRINT "GOOD GOING!"
5230 D = D - 50
6000 REM   GO AGAIN?
6010 PA =   INT (600 - D) / 100
6020 PRINT
6030 PRINT "YOUR PRESENT PAY IS ";PA
6040 PRINT "DOLLARS PER HOUR."
6050 PRINT
6060 PRINT "WOULD YOU LIKE TO GO AGAIN?"
6070 PRINT "(YES OR NO)"
6080 INPUT SA$
6090 IF SA$ = "NO" THEN 20060
6100 REM   RESET
6110 PA = 0
6120 CT = 0
6130 SS = 0
6140 SA = 0
6150 CC = 0
6160 SC = 0
6170 DF = 0
6180 PB = 0
6190 PRINT
6200 PRINT "PRESS 'RETURN' TO START!"
6210 INPUT SA$
6220 GOTO 4000
10000 REM      RANDOMIZATION
10010 R =   RND(MX*100)
10020 R=R/100
10030 R$ =   STR$ (R)
10040 RETURN
11000 REM   JUDGE ANSWER
11010 CT = CT +   VAL (R$)
11020 SS = SS + SA
11030 PB = PB + 1
11040 IF PB = 11 THEN 4120
11050 RETURN
18000 REM   SCROLLING
18010 FOR I = 1 TO L
18020 PRINT
18030 NEXT I
18040 RETURN
19000 REM   DELAY
19010 FOR I = 1 TO D
19020 NEXT I
19030 RETURN
20000 REM   CLOSE
20010 PRINT "YOU ARE A SUPER WHIZ AT THE CHECKOUT"
20020 PRINT "COUNTER!  YOU MAY RETIRE WITH FULL"
20030 PRINT "BENIFITS!"
20040 PRINT
20050 PRINT "BYE!"
20060 END
```

TABLE OF VARIABLES

CC - REQUIRED CHANGE
4250 4260 4260 4270 4540 4540
4560 4580 4590 6150

CT - CORRECT TOTAL
5020 5060 5060 5080 5090 5110
5170 6120 11010 11010

D - DELAY
2070 3040 3100 3180 3250 4010
4620 4620 4690 4690 4720 4720
5140 5140 5200 5200 5230 5230
6010 19010

DF - DEFICIT FROM WRONG KEY IN
5110 5120 5170 5180 6170

I - COUNTER
10030 10040 10040 10050 10060
18010 18030 19010 19020

J - COUNTER
2030 2090

L - LINES OF SCROLLING
2010 2050 3120 3220 4030 18010

MX - MAXIMUM VALUES DISPLAYED
1010 3260 10010

PA - CUSTOMER PAYS THIS AMOUNT
4170 4170 4180 4220 4250 6010
6030 6110

PB - NO. OF PRICES DISPLAYED
6180 11030 11030 11040

R - RANDOM NUMBER
10010 10020

R$ - RANDOM NUMBER AS STRING (NEEDED FOR TRAILING ZEROS)
3080 3170 4050 10020 10030
10040 10050 10060 10060 11010

SA - STUDENT ANSWER
4090 4340 4350 4370 4380 4400
4410 4430 4440 4460 4470 4490
4500 6140 11020

SA$ - STUDENT ANSWER
2310 3160 3170 4140 6080 6090

6210

SC - CHANGE RETURNED BY STUDENT
4350 4350 4380 4380 4410 4410
4440 4440 4470 4470 4500 4500
4520 4550 4550 4560 4590 6160

SS
4150 4180 4250 5040 5070 5070
5080 5090 5110 5170 6130 11020
11020

END OF VAR. LIST

SAMPLE RUN

THIS PROGRAM ROUGHLY SIMULATES SOME OF
THE THINGS YOU WOULD DO AT A DEPARTMENT
STORE CHECK OUT COUNTER.

YOU WILL SEE A BUNCH OF PRICES, AND
TYPE THEM ONE AT A TIME INTO THE
COMPUTER. YOU MUST TYPE THEM IN
ACCURATELY, OR YOU WILL HAVE ANGRY
CUSTOMERS AFTER YOU!

AFTER TYPING IN ALL THE PRICES, YOU
WILL RING UP A TOTAL, BE GIVEN CASH,
AND MAKE THE CORRECT CHANGE.
ONCE AGAIN, YOU MUST BE ACCURATE!

AS YOU PROCEED, THE PRICES WILL MOVE
FASTER AND FASTER. THE FASTER YOU CAN
GO WITHOUT MISTAKES, THE HIGHER YOUR
PAY WILL BE!

PUSH 'RETURN' TO START.
?

YOU WILL SEE A PRICE, LIKE THIS:

                    2.65

AS SOON AS THE PRICE DISAPPEARS, TYPE
IT IN AND PUSH 'RETURN.
?2.65
VERY GOOD!

              HERE WE GO!

                    4.20

?4.20

                        5.29

?5.29

                        4.14

?4.41

                        7.97

?7.97

                        5.41

?5.41

                        .39

?.39

                        2.64

?2.64

                        4.48

?4.48

                        7.24

?7.24

                        1.34

?1.34

                        .57

?.57
PUSH 'RETURN' TO GET
THE TOTAL.
?
YOUR TOTAL IS 43.94

THE CUSTOMER PAYS YOU WITH 50
DOLLARS.

THE REQUIRED CHANGE IS 6.06
DOLLARS.

CHANGE BACK:

HOW MANY 'FIVES'?
?1
HOW MANY 'ONES'?
?1
HOW MANY 'QUARTERS'?
?0
HOW MANY 'DIMES'?
?0
HOW MAY 'NICKLES'?
?1
HOW MANY 'PENNIES'?
?1

YOU GAVE THE CUSTOMER 6.06
DOLLARS CHANGE.
GOOD GOING!
 A SPOT CHECK OF THE PURCHASES
SHOWS THE CORRECT TOTAL IS: 43.67
DOLLARS.
YOUR TOTAL WAS: 43.94
DOLLARS.
YOU OVER CHARGED THE CUSTOMER
.27 DOLLARS
BECAUSE YOU KEYED IN THE PRICES WRONG!

YOUR PRESENT PAY IS 3
DOLLARS PER HOUR.

WOULD YOU LIKE TO GO AGAIN?
(YES OR NO)
?NO

Stock Market

PROGRAM DESCRIPTION

This program is a simulation of some of the events that take place during the buying and selling of stock in companies on a stock exchange. The program enables you to place orders with the computer just as you would by phoning a stockbroker from your own home. You may choose to buy and sell stock from a limited portfolio of stocks based upon newspaper headlines relevant to those companies that own the shares of stock.

You start with $10,000 and your main objective is to increase that value as much as possible in six buying and selling sessions. Do watch the newspaper headlines carefully. They are your only hints to guide you toward success or failure in the market. The computer may create more havoc because the newspaper headlines are not always true statements. You have to read "between the lines." A computer printer would prove very valuable in this simulation program by making it easier to refer to your past stock transactions.

PROGRAM NOTES

This is a very simple introduction to the stock market. Consider adding complicating factors (dividends, mergers, etc.) as your group can handle them. Although it rarely is this simple, additional subroutines might fit right into the "gosubs" in the main program (starting on line 4000).

```
100 REM STOCK MARKET BY GARY ORWIG
500 REM PLACE MESSAGE ON SCREEN
510 PRINT
520 PRINT "ONE MOMENT, PLEASE!"
530 PRINT "I AM READING DATA."
1000 REM INITIALIZE
1010 DIM G$(700),GF(7),N$(700),N1(7),N2(7),N3(7),N4(7),N5(7)
,N6(7),S$(700),SY(7),SN(7),OD(7),SM$(700)
1020 DIM C(6),S(6),N(6)
1030 DIM GI$(100),NI$(100),SI$(100),SMI$(100),SA$(5),SMN$(10
O)
1040 FOR I=1 TO 10
1050 G$(I*70-69,I*70)="

1060 NEXT I
1070 N$=G$:S$=G$:SM$=G$
1080 FOR I=1 TO 2
1090 GI$(I*50-49,I*50)="
                        "
1100 NEXT I
1110 NI$=GI$:SI$=GI$:SMI$=GI$:SMN$=GI$
1120 LN=1
1130 FOR I=1 TO 7
1140 READ GI$,GF
1150 G$(LN)=GI$:GF(I)=GF
1160 LN=LN+100
1170 NEXT I
1180 LN=1
1190 FOR I=1 TO 7
1200 READ NI$,N1,N2,N3,N4,N5,N6
1210 N$(LN)=NI$:N1(I)=N1:N2(I)=N2:N3(I)=N3:N4(I)=N4:N5(I)=N5
:N6(I)=N6
1220 LN=LN+100
1230 NEXT I
1240 LN=1
1250 FOR I=1 TO 7
1260 READ SI$,SY,SN,OD,SMI$
1270 S$(LN)=SI$:SY(I)=SY:SN(I)=SN:OD(I)=OD:SM$(LN)=SMI$
1280 LN=LN+100
1290 NEXT I
1300 CA=10000:REM CASH TO START WITH
1310 C(1)=20:REM THESE 6 VALUES ARE STARTING PRICES OF STOCK
.
1320 C(2)=30
1330 C(3)=70
1340 C(4)=40
1350 C(5)=50
1360 C(6)=40
1370 FOR I=1 TO 6
1380 S(I)=0
1390 NEXT I
1400 REM USE FULL SCREEN
1410 POKE 82,0
1420 PRINT
```

```
2000 REM INTRODUCTION
2010 FOR I=1 TO 50
2020 PRINT "STOCK MARKET      ";
2030 NEXT I
2040 PRINT
2050 PRINT
2060 PRINT
2070 FOR I=1 TO 200
2080 PRINT "THIS IS A SIMULATION OF SOME OF THE"
2090 PRINT "EVENTS WHICH TAKE PLACE IN THE"
2100 PRINT "BUYING AND SELLING OF STOCK."
2110 PRINT
2120 PRINT "YOU GET TO BUY AND SELL FROM A LIMITED"
2130 PRINT "PORTFOLIO OF STOCKS BASED UPON NEWS"
2140 PRINT "HEADLINES RELEVANT TO THOSE COMPANIES."
2150 PRINT
2160 PRINT "YOU START WITH 10000 DOLLARS, AND YOUR"
2170 PRINT "SOLE MISSION IS TO INCREASE THAT VALUE"
2180 PRINT "AS MUCH AS POSSIBLE IN 6 BUYING/SELLING"
2190 PRINT "SESSIONS."
2200 PRINT "DO WATCH THE HEADLINES CAREFULLY."
2210 PRINT "THEY ARE YOUR ONLY HINTS FOR SUCCESS."
2220 PRINT "BE CAREFUL, THOUGH BECAUSE NOT ALL"
2230 PRINT "HEADLINES ALWAYS TURN OUT TO BE TRUE!"
2240 PRINT
2250 PRINT
2260 PRINT
2270 PRINT
2280 PRINT "PRESS 'RETURN' TO CONTINUE."
2290 INPUT SA$
2300 PRINT
2310 PRINT
2320 PRINT "HERE ARE THE COMPANIES:"
2330 PRINT
2340 PRINT "MIDNIGHT OIL COMPANY"
2350 PRINT "A COMPANY KNOWN FOR TAKING BIG RISKS."
2360 PRINT "SOMETIMES THEY WIN, BUT OFTEN THEY LOSE!"
2370 PRINT
2380 PRINT "SOLAR SEEKERS, INC."
2390 PRINT "A NEW COMPANY JUST GETTING ESTABLISHED."
2400 PRINT "APPEAR TO EMPLOY A NUMBER OF HIGH"
2410 PRINT "TECHNOLOGY EXPERTS."
2420 PRINT
2430 PRINT "MCDANIEL AIRCRAFT"
2440 PRINT "A WELL ESTABLISHED MILITARY/INDUSTRIAL"
2450 PRINT "ORIENTED AERONAUTICS COMPANY."
2460 PRINT
2470 PRINT
2480 PRINT
2490 PRINT "PRESS 'RETURN' TO CONTINUE."
2500 INPUT SA$
2510 PRINT
2520 PRINT
2530 PRINT
2540 PRINT "HAPPY DAYS SOUTHERN MOTELS"
2550 PRINT "A LARGE CHAIN OF SOUTH UNITED STATES"
```

```
2560 PRINT "MOTELS.   LARGELY DEPENDENT UPON TOURISM."
2570 PRINT "COMMUNITY PHONE COMPANY"
2580 PRINT "A TYPICAL UTILITY - - CONSERVATIVE AND"
2590 PRINT "FAIRLY IMMUNE TO WORLD PROBLEMS."
2600 PRINT
2610 PRINT "FRIENDLY ELECTRIC COMPANY"
2620 PRINT "A VERY PROGRESSIVE UTILITY, HEAVY INTO"
2630 PRINT "NUCLEAR POWER, WITH QUITE A BIT OF"
2640 PRINT "COMMUNITY OPPOSITION."
2650 PRINT
2660 PRINT
2670 PRINT "PRESS 'RETURN' TO CONTINUE."
2680 INPUT SA$
2690 PRINT
2700 PRINT
2710 PRINT
2720 PRINT "HERE WE GO!"
2730 PRINT
2740 PRINT
2750 PRINT
2760 FOR I=1 TO 150
2770 NEXT I
4000 REM MAIN PROGRAM
4010 DA=DA+1
4020 IF DA=7 THEN 20000
4030 GOSUB 5000
4040 GOSUB 6000
4050 GOSUB 8000
4060 GOSUB 7000
4070 IF SF=SN THEN PRINT SM$(C*100-99,C*100)
4080 FOR I=1 TO 150
4090 NEXT I
4100 GOTO 4000
5000 REM PRINT HEADLINES
5010 GOSUB 10000
5020 IF G$(R*100-99,R*100-99)="*" THEN 5010
5030 PRINT G$(R*100-99,R*100)
5040 G$(R*100-99,R*100)="*"
5050 GF=GF(R)
5060 GOSUB 10000
5070 IF N$(R*100-99,R*100-99)="*" THEN 5060
5080 PRINT N$(R*100-99,R*100)
5090 N$(R*100-99,R*100)="*"
5100 N(1)=N1(R)
5110 N(2)=N2(R)
5120 N(3)=N3(R)
5130 N(4)=N4(R)
5140 N(5)=N5(R)
5150 N(6)=N6(R)
5160 GOSUB 10000
5170 IF S$(R*100-99,R*100-99)="*" THEN 5160
5180 PRINT S$(R*100-99,R*100)
5190 S$(R*100-99,R*100)="*"
5200 SY=SY(R)
5210 SN=SN(R)
5220 OD=OD(R)
```

```
5230 SMN$=SM$(R*100-99,R*100)
5240 C=R
5250 RETURN
6000 REM MENU
6010 VA=0
6020 FOR I=1 TO 6
6030 VA=VA+S(I)*C(I)
6040 NEXT I
6050 GOSUB 16000
6060 PRINT "COMPANY          SHARES          VALUE"
6070 PRINT
6080 PRINT "1. MID. OIL    "," ";S(1),C(1)
6090 PRINT "2. SOL SEE     "," ";S(2),C(2)
6100 PRINT "3. MC AIR      "," ";S(3),C(3)
6110 PRINT "4. HAP MO      "," ";S(4),C(4)
6120 PRINT "5. COM PHO     "," ";S(5),C(5)
6130 PRINT "6. FRI ELEC    "," ";S(6),C(6)
6140 PRINT "CASH ON HAND: ";CA
6150 PRINT "VALUE OF STOCK: ";VA
6160 PRINT "TOTAL WORTH: ";CA+VA
6170 RETURN
7000 REM CALCULATE STOCK VALUE
7010 FOR I=1 TO 6
7020 C(I)=C(I)*GF*N(I)
7030 NEXT I
7040 GOSUB 10500
7050 IF R>OD THEN GOTO 7080
7060 SF=SY
7070 GOTO 7090
7080 SF=SN
7090 C(C)=C(C)*SF
7100 RETURN
8000 REM PURCHASE,SELL
8010 PRINT "DO YOU WISH TO: "
8020 PRINT " 1. PURCHASE    2. SELL    3. NEITHER"
8030 PRINT "ENTER 1, 2, OR 3"
8040 INPUT Z
8050 IF Z<1 OR Z>3 THEN 8030
8060 IF Z=2 THEN 8190
8070 IF Z=3 THEN RETURN
8080 PRINT "BUY WHICH NUMBER?"
8090 PRINT "ENTER A NUMBER 1 THROUGH 6."
8100 INPUT Z
8110 PRINT "HOW MANY SHARES?"
8120 INPUT Z2
8130 IF C(Z)*Z2>CA THEN GOTO 8170
8140 S(Z)=S(Z)+Z2
8150 CA=CA-(C(Z)*Z2)
8160 GOTO 4040
8170 PRINT "YOU DON'T HAVE ENOUGH MONEY!"
8180 GOTO 8000
8190 PRINT "SELL WHICH NUMBER?"
8200 PRINT "ENTER A NUMBER 1 THROUGH 6"
8210 INPUT Z
8220 IF Z<1 OR Z>6 THEN 8200
8230 PRINT "HOW MANY SHARES?"
```

```
8240 INPUT Z2
8250 IF Z2>S(Z) THEN 8290
8260 S(Z)=S(Z)-Z2
8270 CA=CA+Z2*C(Z)
8280 GOTO 4040
8290 PRINT "YOU DON'T HAVE THAT MANY SHARES!"
8300 GOTO 8000
10000 REM RANDOMIZATION
10010 R=INT(RND(0)*6)+1
10020 RETURN
10500 R=INT(RND(0)*4)+1
10510 RETURN
16000 REM ROUNDING
16010 FOR I=1 TO 6
16020 S(I)=INT(S(I)*100)/100
16030 C(I)=INT(C(I)*100)/100
16040 NEXT I
16050 CA=INT(CA*100)/100
16060 VA=INT(VA*100)/100
16070 RETURN
20000 REM CLOSING
20010 GOSUB 6000
20020 PRINT "YOU HAVE COMPLETED THE SIX CYCLES!"
20030 PRINT "YOU STARTED WITH 10000 DOLLARS."
20040 PRINT "YOU NOW HAVE ";CA;" DOLLARS CASH."
20050 PRINT "AND ";VA;" DOLLARS WORTH OF STOCK."
20060 PRINT "THIS IS A TOTAL VALUE OF ";CA+VA;" DOLLARS."
20070 END
20080 PRINT "BYE FOR NOW!"
20090 END
21000 REM DATA
21010 DATA DOLLAR LOSES VALUE OVERSEAS!,.90
21020 DATA DOLLAR GAINS VALUE OVERSEAS!,1.10
21030 DATA WORSENING RELATIONS WITH COMMUNIST        COUNTRIES
!,.85
21040 DATA KEY CABINET MEMBER CAUGHT TAKING BRIBES,.95
21050 DATA INFLATION TAPERING OFF.,1.10
21060 DATA SERIOUS RECESSIONS LOOMS!,.80
21070 DATA EOD,0
21080 DATA STEEL STRIKE!,.85,.95,.80,1.0,1.0,1.0
21090 DATA SERIOUS GASOLINE SHORTAGE. PRICES        SKYROCKET
!,1.4,1.2,.95,.75,1.0,1.0
21100 DATA WAR IN MID EAST!,1.2,1.0,1.4,1.0,1.0,1.0
21110 DATA SAFE DISPOSAL OF ATOMIC WASTE FOUND!,.80,.90,1.0,
1.0,1.0,1.2
21120 DATA HUGE NEW COAL FIELD FOUND IN U.S.!,.75,.80,1.1,1.
0,1.0,1.1
21130 DATA RECORD COLD WINTER HITS!,1.2,1.2,1.0,1.7,1.0,1.0
21140 DATA EOD,0,0,0,0,0,0
21150 DATA RUMOR OF NEW OIL FIELD DISCOVERY BY      MIDNIGHT
OIL!,2.5,.1,1
21160 DATA OIL FIELD A BUST - MIDNIGHT OIL DOWN      THE TUBE
S!
21170 DATA NEW  INEXPENSIVE ELECTRIC CELL FOUND     BY SOLAR
SEEKERS!,2.0,.75,3
21180 DATA SOLAR CELL NOT YET PERFECTED - IT MELTS
```

```
21190 DATA MCDANIEL AIRCRAFT SELLS 100 JETS TO     MIDEAST.,
1.5,.75,3
21200 DATA GOVERNMENT ACCUSSES MCDANIEL AIRCRAFT    OF WAR -
MONGERING!
21210 DATA HAPPY DAYS SOUTHERN MOTELS ANNOUNCES     GRAND OPE
NING OF NEW LUXURY RETREAT AT   KEY WEST.,2.0,.2,3
21220 DATA HURRICANE HITS KEY WEST - NEW RESORT     DESTROYE
D!
21230 DATA PHONE RATES FROZEN BY CONSUMERS' GROUP,.8,1.0,2
21240 DATA COURT OVER - RULES PHONE RATE FREEZE.
21250 DATA FRIENDLY ELECTRIC COMPANY LOSES MAIN     ATOMIC RE
ACTOR!,.75,1.0,2
21260 DATA REACTOR DAMAGE MINOR - BACK IN OPERATION
21270 DATA EOD,0,0,0,EOD
```

TABLE OF VARIABLES

G$
```
   1010   1050   1070   1070   1070   1150
   5020   5030   5040
```

GF(
```
   1010   1150   5050
```

N$
```
   1010   1070   1210   5070   5080   5090
```

N1(
```
   1010   1210   5100
```

N2(
```
   1010   1210   5110
```

N3(
```
   1010   1210   5120
```

N4(
```
   1010   1210   5130
```

N5(
```
   1010   1210   5140
```

N6(
```
   1010   1210   5150
```

S$
```
   1010   1070   1270   5170   5180   5190
```

SY(
```
   1010   1270   5200
```

SN(
```
   1010   1270   5210
```

OD(
```
   1010   1270   5220
```

SM$
```
   1010   1070   1270   4070   5230
```

C(
```
   1020   1310   1320   1330   1340   1350
   1360   6030   6080   6090   6100   6110
   6120   6130   7020   7020   7090   7090
   8130   8150   8270   16030  16030
```

S(
```
   1020   1380   6030   6080   6090   6100
   6110   6120   6130   8140   8140   8250
   8260   8260   16020  16020
```

N(
```
   1020   5100   5110   5120   5130   5140
   5150   7020
```

GI$
```
   1030   1090   1110   1110   1110   1110
   1140   1150
```

NI$
```
   1030   1110   1200   1210
```

SI$
```
   1030   1110   1260   1270
```

SMI$
```
   1030   1110   1260   1270
```

SA$
```
   1030   2290   2500   2680
```

SMN$
```
   1030   1110   5230
```

I
```
   1040   1050   1050   1060   1080   1090
   1090   1100   1130   1150   1170   1190
   1210   1210   1210   1210   1210   1210
   1230   1250   1270   1270   1270   1290
   1370   1380   1390   2010   2030   2070
   2760   2770   4080   4090   6020   6030
   6030   6040   7010   7020   7020   7020
   7030   16010  16020  16020  16030  16030
   16040
```

LN
```
   1120   1150   1160   1160   1180   1210
   1220   1220   1240   1270   1270   1280
   1280
```

GF
    1140   1150   5050   7020

N1
    1200   1210

N2
    1200   1210

N3
    1200   1210

N4
    1200   1210

N5
    1200   1210

N6
    1200   1210

SY
    1260   1270   5200   7060

SN
    1260   1270   4070   5210   7080

OD
    1260   1270   5220   7050

CA
    1300   6140   6160   8130   8150   8150
    8270   8270   16050   16050   20040   20060

DA
    4010   4010   4020

SF
    4070   7060   7080   7090

C
    4070   4070   5240   7090   7090

R
    5020   5020   5030   5030   5040   5040
    5050   5070   5070   5080   5080   5090
    5090   5100   5110   5120   5130   5140
    5150   5170   5170   5180   5180   5190
    5190   5200   5210   5220   5230   5230
    5240   7050   10010   10500

VA
    6010   6030   6030   6150   6160   16060
    16060   20050   20060

Z
```
  8040   8050   8050   8060   8070   8100
  8130   8140   8140   8150   8210   8220
  8220   8250   8260   8260   8270
```

Z2
```
  8120   8130   8140   8150   8240   8250
  8260   8270
```


PROGRAM LISTING: MICROSOFT BASIC

```
100 REM STOCK MARKET BY GARY ORWIG
500 REM RESEED RND
510 RANDOMIZE
1000 REM INITIALIZE
1010 REM DEFINE A FUNCTION TO ROUND NO.S TO 2 PLACES.
1020 DEF RD(X) = INT(X*100+.5)*.01
1030 DIM G$(6),GF(6),N$(6),N1(6),N2(6),N3(6),N4(6),N5(6),N6(
6),S$(6),SY(6),SN(6),OD(6),SM$(6)
1040 DIM C(6),S(6),N(6)
1050 FOR I=1 TO 6
1060 READ G$(I),GF(I)
1070 NEXT I
1080 FOR I=1 TO 6
1090 READ N$(I),N1(I),N2(I),N3(I),N4(I),N5(I),N6(I)
1100 NEXT I
1110 FOR I=1 TO 6
1120 READ S$(I),SY(I),SN(I),OD(I),SM$(I)
1130 NEXT I
1140 CA=10000:REM CASH TO START WITH
1150 C(1)=20:REM THESE 6 VALUES ARE STARTING PRICES OF STOCK
   .
1160 C(2)=30
1170 C(3)=70
1180 C(4)=40
1190 C(5)=50
1200 C(6)=40
1210 REM USE FULL SCREEN
1220 POKE 82,0
1230 CLS
2000 REM INTRODUCTION
2010 FOR I=1 TO 50
2020 PRINT "STOCK MARKET
2030 NEXT I
2040 PRINT
2050 PRINT
2060 PRINT
2070 FOR I=1 TO 1000
2080 NEXT I
2090 PRINT "THIS IS A SIMULATION OF SOME OF THE"
2100 PRINT "EVENTS WHICH TAKE PLACE IN THE"
2110 PRINT "BUYING AND SELLING OF STOCK."
2120 PRINT
2130 PRINT "YOU GET TO BUY AND SELL FROM A LIMITED"
2140 PRINT "PORTFOLIO OF STOCKS BASED UPON NEWS"
```

```
2150 PRINT "HEADLINES RELEVANT TO THOSE COMPANIES."
2160 PRINT
2170 PRINT "YOU START WITH 10000 DOLLARS, AND YOUR"
2180 PRINT "SOLE MISSION IS TO INCREASE THAT VALUE"
2190 PRINT "AS MUCH AS POSSIBLE IN 6 BUYING/SELLING"
2200 PRINT "SESSIONS."
2210 PRINT "DO WATCH THE HEADLINES CAREFULLY."
2220 PRINT "THEY ARE YOUR ONLY HINTS FOR SUCCESS."
2230 PRINT "BE CAREFUL, THOUGH BECAUSE NOT ALL"
2240 PRINT "HEADLINES ALWAYS TURN OUT TO BE TRUE!"
2250 PRINT
2260 PRINT
2270 PRINT
2280 PRINT
2290 PRINT "PRESS 'RETURN' TO CONTINUE."
2300 INPUT SA$
2310 PRINT
2320 PRINT
2330 PRINT "HERE ARE THE COMPANIES:"
2340 PRINT
2350 PRINT "MIDNIGHT OIL COMPANY"
2360 PRINT "A COMPANY KNOWN FOR TAKING BIG RISKS."
2370 PRINT "SOMETIMES THEY WIN, BUT OFTEN THEY LOSE!"
2380 PRINT
2390 PRINT "SOLAR SEEKERS, INC."
2400 PRINT "A NEW COMPANY JUST GETTING ESTABLISHED."
2410 PRINT "APPEAR TO EMPLOY A NUMBER OF HIGH"
2420 PRINT "TECHNOLOGY EXPERTS."
2430 PRINT
2440 PRINT "MCDANIEL AIRCRAFT"
2450 PRINT "A WELL ESTABLISHED MILITARY/INDUSTRIAL"
2460 PRINT "ORIENTED AERONAUTICS COMPANY."
2470 PRINT
2480 PRINT
2490 PRINT
2500 PRINT "PRESS 'RETURN' TO CONTINUE."
2510 INPUT SA$
2520 PRINT
2530 PRINT
2540 PRINT
2550 PRINT "HAPPY DAYS SOUTHERN MOTELS"
2560 PRINT "A LARGE CHAIN OF SOUTH UNITED STATES"
2570 PRINT "MOTELS.  LARGELY DEPENDENT UPON TOURISM."
2580 PRINT "COMMUNITY PHONE COMPANY"
2590 PRINT "A TYPICAL UTILITY - - CONSERVATIVE AND"
2600 PRINT "FAIRLY IMMUNE TO WORLD PROBLEMS."
2610 PRINT
2620 PRINT "FRIENDLY ELECTRIC COMPANY"
2630 PRINT "A VERY PROGRESSIVE UTILITY, HEAVY INTO"
2640 PRINT "NUCLEAR POWER, WITH QUITE A BIT OF"
2650 PRINT "COMMUNITY OPPOSITION."
2660 PRINT
2670 PRINT
2680 PRINT "PRESS 'RETURN' TO CONTINUE."
2690 INPUT SA$
2700 PRINT
```

```
2710 PRINT
2720 PRINT
2730 PRINT "HERE WE GO!"
2740 PRINT
2750 PRINT
2760 PRINT
2770 FOR I=1 TO 1500
2780 NEXT I
4000 REM MAIN PROGRAM
4010 DA=DA+1
4020 IF DA=7 THEN 20000
4030 GOSUB 5000
4040 GOSUB 6000
4050 GOSUB 8000
4060 GOSUB 7000
4070 IF SF=SN THEN PRINT SM$(C)
4080 GOTO 4000
5000 REM PRINT HEADLINES
5010 GOSUB 10000
5020 IF G$(R)="*" THEN 5010
5030 PRINT G$(R)
5040 G$(R)="*"
5050 GF=GF(R)
5060 GOSUB 10000
5070 IF N$(R)="*" THEN 5060
5080 PRINT N$(R)
5090 N$(R)="*"
5100 N(1)=N1(R)
5110 N(2)=N2(R)
5120 N(3)=N3(R)
5130 N(4)=N4(R)
5140 N(5)=N5(R)
5150 N(6)=N6(R)
5160 GOSUB 10000
5170 IF S$(R)="*" THEN 5160
5180 PRINT S$(R)
5190 S$(R)="*"
5200 SY=SY(R)
5210 SN=SN(R)
5220 OD=OD(R)
5230 SM$=SM$(R)
5240 C=R
5250 RETURN
6000 REM MENU
6010 VA=0
6020 FOR I=1 TO 6
6030 VA=VA+S(I)*C(I)
6040 NEXT I
6050 GOSUB 16000
6060 PRINT "COMPANY          SHARES          VALUE"
6070 PRINT
6080 PRINT "1. MID. OIL   ";"    ";S(1);"          ";C(1)
6090 PRINT "2. SOL SEE    ";"    ";S(2);"          ";C(2)
6100 PRINT "3. MC AIR     ";"    ";S(3);"          ";C(3)
6110 PRINT "4. HAP MO     ";"    ";S(4);"          ";C(4)
6120 PRINT "5. COM PHO    ";"    ";S(5);"          ";C(5)
```

```
6130 PRINT "6. FRI ELEC    ";"      ";S(6);"           ";C(6)
6140 PRINT "CASH ON HAND: ";CA
6150 PRINT "VALUE OF STOCK: ";VA
6160 PRINT "TOTAL WORTH: ";CA+VA
6170 RETURN
7000 REM CALCULATE STOCK VALUE
7010 FOR I=1 TO 6
7020 C(I)=C(I)*GF*N(I)
7030 NEXT I
7040 GOSUB 10500
7050 IF R > OD THEN GOTO 7080
7060 SF=SY
7070 GOTO 7090
7080 SF=SN
7090 C(C)=C(C)*SF
7100 RETURN
8000 REM PURCHASE,SELL
8010 PRINT "DO YOU WISH TO: "
8020 PRINT "    1. PURCHASE"
8030 PRINT "    2. SELL"
8040 PRINT "    3. NEITHER"
8050 PRINT "ENTER 1, 2, OR 3"
8060 INPUT Z
8070 IF Z<1 OR Z>3 THEN 8050
8080 IF Z=2 THEN 8210
8090 IF Z=3 THEN RETURN
8100 PRINT "BUY WHICH NUMBER?"
8110 PRINT "ENTER A NUMBER 1 THROUGH 6."
8120 INPUT Z
8130 PRINT "HOW MANY SHARES?"
8140 INPUT Z2
8150 IF C(Z) * Z2 > CA THEN GOTO 8190
8160 S(Z)=S(Z)+Z2
8170 CA=CA-(C(Z)*Z2)
8180 GOTO 4040
8190 PRINT "YOU DON'T HAVE ENOUGH MONEY!"
8200 GOTO 8000
8210 PRINT "SELL WHICH NUMBER?"
8220 PRINT "ENTER A NUMBER 1 THROUGH 6"
8230 INPUT Z
8240 IF Z<1 OR Z>6 THEN 8220
8250 PRINT "HOW MANY SHARES?"
8260 INPUT Z2
8270 IF Z2>S(Z) THEN 8310
8280 S(Z)=S(Z)-Z2
8290 CA=CA+Z2*C(Z)
8300 GOTO 4040
8310 PRINT "YOU DON'T HAVE THAT MANY SHARES!"
8320 GOTO 8000
10000 REM RANDOMIZATION
10010 R=RND(6)
10020 RETURN
10500 R=RND(4)
10510 RETURN
16000 REM ROUNDING ROUTINE
16010 FOR I=1 TO 6
```

```
16020 S(I) = RD(S(I))
16030 C(I) = RD(C(I))
16040 NEXT I
16050 CA = RD(CA)
16060 VA = RD(VA)
16070 RETURN
20000 REM CLOSING
20010 GOSUB 6000
20020 PRINT "YOU HAVE COMPLETED THE SIX CYCLES!"
20030 PRINT "YOU STARTED WITH 10000 DOLLARS."
20040 PRINT "YOU NOW HAVE ";CA;" DOLLARS CASH."
20050 PRINT "AND ";VA;" DOLLARS WORTH OF STOCK."
20060 PRINT "THIS IS A TOTAL VALUE OF ";CA+VA;" DOLLARS."
20070 END
20080 PRINT "BYE FOR NOW!"
20090 END
21000 REM DATA
21010 DATA "DOLLAR LOSES VALUE OVERSEAS!",.90
21020 DATA "DOLLAR GAINS VALUE OVERSEAS!",1.10
21030 DATA "WORSENING RELATIONS WITH COMMUNIST      COUNTRIE
S!",.85
21040 DATA "KEY CABINET MEMBER CAUGHT TAKING BRIBES",.95
21050 DATA "INFLATION TAPERING OFF.",1.10
21060 DATA "SERIOUS RECESSIONS LOOMS!",.80
21070 DATA "STEEL STRIKE!",.85,.95,.80,1.0,1.0,1.0
21080 DATA "SERIOUS GASOLINE SHORTAGE, PRICES      SKYROCKE
T!",1.4,1.2,.95,.75,1.0,1.0
21090 DATA "WAR IN MID EAST!",1.2,1.0,1.4,1.0,1.0,1.0
21100 DATA "SAFE DISPOSAL OF ATOMIC WASTE FOUND!",.80,.90,1.
0,1.0,1.0,1.2
21110 DATA "HUGE NEW COAL FIELD FOUND IN U.S.!",.75,.80,1.1,
1.0,1.0,1.1
21120 DATA "RECORD COLD WINTER HITS!",1.2,1.2,1.0,1.7,1.0,1.
0
21130 DATA "RUMOR OF NEW OIL FIELD DISCOVERY BY      MIDNIGHT
 OIL!",2.5,.1,1
21140 DATA "OIL FIELD A BUST, MIDNIGHT OIL DOWN      THE TUBE
S!"
21150 DATA "NEW, INEXPENSIVE ELECTRIC CELL FOUND      BY SOLAR
 SEEKERS!",2.0,.75,3
21160 DATA "SOLAR CELL NOT YET PERFECTED - IT MELTS"
21170 DATA "MCDANIEL AIRCRAFT SELLS 100 JETS TO      MIDEAST.
",1.5,.75,3
21180 DATA "GOVERNMENT ACCUSSES MCDANIEL AIRCRAFT    OF WAR -
 MONGERING!"
21190 DATA "HAPPY DAYS SOUTHERN MOTELS ANNOUNCES     GRAND OP
ENING OF NEW LUXURY RETREAT AT   KEY WEST.",2.0,.2,3
21200 DATA "HURRICANE HITS KEY WEST, NEW RESORT      DESTROYE
D!"
21210 DATA "PHONE RATES FROZEN BY CONSUMERS' GROUP",.8,1.0,2
21220 DATA "COURT OVER - RULES PHONE RATE FREEZE."
21230 DATA "FRIENDLY ELECTRIC COMPANY LOSES MAIN     ATOMIC R
EACTOR!",.75,1.0,2
21240 DATA "REACTOR DAMAGE MINOR, BACK IN OPERATION"
```

TABLE OF VARIABLES

*RD(*) — ROUNDING FUNCTION
1020 16020 16030 16050 16060

C — BUFFER FOR RANDOM NUMBER
4070 5240 7090 7090

C(*) — VALUE OF STOCKS
1040 1150 1160 1170 1180 1190
1200 6030 6080 6090 6100 6110
6120 6130 7020 7020 7090 7090
8150 8170 8290 16030 16030

CA — CASH ON HAND
1140 6140 6160 8150 8170 8170
8290 8290 16050 16050 20040
20060

DA — DAY NUMBER
4010 4010 4020

G$(*) — GENERAL INTEREST HEADLINES LIST
1030 1060 5020 5030 5040

GF — GENERAL HEADLINE FACTOR
5050 7020

GF(*) — GENERAL HEADLINES FACTORS LIST
1030 1060 5050

I — COUNTER
1050 1060 1060 1070 1080 1090
1090 1090 1090 1090 1090 1090
1100 1110 1120 1120 1120 1120
1120 1130 2010 2030 2070 2080
2770 2780 6020 6030 6030 6040
7010 7020 7020 7020 7030 16010
16020 16020 16030 16030 16040

N$(*) — SPECIFIC HEADLINES LIST
1030 1090 5070 5080 5090

N(*) — SPECIFIC HEADLINE FACTOR
1040 5100 5110 5120 5130 5140
5150 7020

N1(*) — SPEC HEAD FACT LIST
1030 1090 5100

N2(*) — " " " "
1030 1090 5110

N3(*) — " " " "
1030 1090 5120

N4(*) — """"
1030 1090 5130

N5(*) — """"
1030 1090 5140

N6(*) — """"
1030 1090 5150

OD — ODDS
5220 7050

OD(*) — ODDS LIST
1030 1120 5220

R — RANDOM NUMBER
5020 5030 5040 5050 5070 5080
5090 5100 5110 5120 5130 5140
5150 5170 5180 5190 5200 5210
5220 5230 5240 7050 10010 10500

S$(*) — POSITIVE NEWS LIST
1030 1120 5170 5180 5190

S(*) — SHARES OF EACH STOCK
1040 6030 6080 6090 6100 6110
6120 6130 8160 8160 8270 8280
8280 16020 16020

SA$ — STUDENT ANSWER
2300 2510 2690

SF — STOCK FACTOR
4070 7060 7080 7090

SM$ — SPECIFIC BAD NEWS
5230

SM$(*) — SPECIFIC BAD NEWS LIST
1030 1120 4070 5230

SN — FACTOR ON NEGATIVE NEWS
4070 5210 7080

SN(*) — FACTOR ON NEGATIVE NEWS LIST
1030 1120 5210

SY — FACTOR ON POSITIVE NEWS
5200 7060

SY(*) — FACTOR ON POSITIVE NEWS LIST
1030 1120 5200

VA — VALUE OF STOCK
6010 6030 6030 6150 6160 16060
16060 20050 20060

X - DEFINE ROUNDING FUNCTION
1020 1020

Z - STUDENT INPUT SELECTION
8060 8070 8070 8080 8090 8120
8150 8160 8160 8170 8230 8240
8240 8270 8280 8280 8290

Z2 - STUDENT INPUT SHARES
8140 8150 8160 8170 8260 8270
8280 8290

END OF VAR. LIST

SAMPLE RUN

THIS IS A SIMULATION OF SOME OF THE
EVENTS WHICH TAKE PLACE IN THE
BUYING AND SELLING OF STOCK.

YOU GET TO BUY AND SELL FROM A LIMITED
PORTFOLIO OF STOCKS BASED UPON NEWS
HEADLINES RELEVANT TO THOSE COMPANIES.

YOU START WITH 10000 DOLLARS, AND YOUR
SOLE MISSION IS TO INCREASE THAT VALUE
AS MUCH AS POSSIBLE IN 6 BUYING/SELLING
SESSIONS.
DO WATCH THE HEADLINES CAREFULLY.
THEY ARE YOUR ONLY HINTS FOR SUCCESS.
BE CAREFUL, THOUGH BECAUSE NOT ALL
HEADLINES ALWAYS TURN OUT TO BE TRUE!

PRESS 'RETURN' TO CONTINUE.
?

HERE ARE THE COMPANIES:

MIDNIGHT OIL COMPANY
A COMPANY KNOWN FOR TAKING BIG RISKS.
SOMETIMES THEY WIN, BUT OFTEN THEY LOSE!

SOLAR SEEKERS, INC.
A NEW COMPANY JUST GETTING ESTABLISHED.
APPEAR TO EMPLOY A NUMBER OF HIGH
TECHNOLOGY EXPERTS.

MCDANIEL AIRCRAFT
A WELL ESTABLISHED MILITARY/INDUSTRIAL
ORIENTED AERONAUTICS COMPANY.

```
PRESS 'RETURN' TO CONTINUE.
?




HAPPY DAYS SOUTHERN MOTELS
A LARGE CHAIN OF SOUTH UNITED STATES
MOTELS.   LARGELY DEPENDENT UPON TOURISM.
COMMUNITY PHONE COMPANY
A TYPICAL UTILITY - - CONSERVATIVE AND
FAIRLY IMMUNE TO WORLD PROBLEMS.

FRIENDLY ELECTRIC COMPANY
A VERY PROGRESSIVE UTILITY, HEAVY INTO
NUCLEAR POWER, WITH QUITE A BIT OF
COMMUNITY OPPOSITION.


PRESS 'RETURN' TO CONTINUE.
?



HERE WE GO!



INFLATION TAPERING OFF.
RECORD COLD WINTER HITS!
NEW, INEXPENSIVE ELECTRIC CELL FOUND      BY SOLAR SEEKERS!
COMPANY              SHARES              VALUE

1. MID. OIL           0                   20
2. SOL SEE            0                   30
3. MC AIR             0                   70
4. HAP MO             0                   40
5. COM PHO            0                   50
6. FRI ELEC           0                   40
CASH ON HAND: 10000
VALUE OF STOCK: 0
TOTAL WORTH: 10000
DO YOU WISH TO:
     1. PURCHASE
     2. SELL
     3. NEITHER
ENTER 1, 2, OR 3
?1
BUY WHICH NUMBER?
ENTER A NUMBER 1 THROUGH 6.
?2
HOW MANY SHARES?
?300
COMPANY              SHARES              VALUE

1. MID. OIL           0                   20
2. SOL SEE           300                  30
```

```
3. MC AIR             0          70
4. HAP MO             0          40
5. COM PHO            0          50
6. FRI ELEC           0          40
CASH ON HAND: 1000
VALUE OF STOCK: 9000
TOTAL WORTH: 10000
DO YOU WISH TO:
     1. PURCHASE
     2. SELL
     3. NEITHER
ENTER 1, 2, OR 3
?1
BUY WHICH NUMBER?
ENTER A NUMBER 1 THROUGH 6.
?1
HOW MANY SHARES?
?100
YOU DON'T HAVE ENOUGH MONEY!
DO YOU WISH TO:
     1. PURCHASE
     2. SELL
     3. NEITHER
ENTER 1, 2, OR 3
?1
BUY WHICH NUMBER?
ENTER A NUMBER 1 THROUGH 6.
?1
HOW MANY SHARES?
?45
COMPANY              SHARES          VALUE

1. MID. OIL          45              20
2. SOL SEE           300             30
3. MC AIR            0               70
4. HAP MO            0               40
5. COM PHO           0               50
6. FRI ELEC          0               40
CASH ON HAND: 100
VALUE OF STOCK: 9900
TOTAL WORTH: 10000
DO YOU WISH TO:
     1. PURCHASE
     2. SELL
     3. NEITHER
ENTER 1, 2, OR 3
?3
KEY CABINET MEMBER CAUGHT TAKING BRIBES
STEEL STRIKE!
MCDANIEL AIRCRAFT SELLS 100 JETS TO     MIDEAST.
COMPANY              SHARES          VALUE

1. MID. OIL          45              26.4
2. SOL SEE           300             79.2
3. MC AIR            0               77
4. HAP MO            0               74.8
```

```
5. COM PHO              0               55
6. FRI ELEC             0               44
CASH ON HAND: 100
VALUE OF STOCK: 24948
TOTAL WORTH: 25048
DO YOU WISH TO:
     1. PURCHASE
     2. SELL
     3. NEITHER
ENTER 1, 2, OR 3
?2
SELL WHICH NUMBER?
ENTER A NUMBER 1 THROUGH 6
?2
HOW MANY SHARES?
?300
COMPANY              SHARES          VALUE

1. MID. OIL            45             26.4
2. SOL SEE             0              79.2
3. MC AIR              0              77
4. HAP MO              0              74.8
5. COM PHO             0              55
6. FRI ELEC            0              44
CASH ON HAND: 23860
VALUE OF STOCK: 1188
TOTAL WORTH: 25048
DO YOU WISH TO:
     1. PURCHASE
     2. SELL
     3. NEITHER
ENTER 1, 2, OR 3
?1
BUY WHICH NUMBER?
ENTER A NUMBER 1 THROUGH 6.
?3
HOW MANY SHARES?
?250
COMPANY              SHARES          VALUE

1. MID. OIL            45             26.4
2. SOL SEE             0              79.2
3. MC AIR              250            77
4. HAP MO              0              74.8
5. COM PHO             0              55
6. FRI ELEC            0              44
CASH ON HAND: 4610
VALUE OF STOCK: 20438
TOTAL WORTH: 25048
DO YOU WISH TO:
     1. PURCHASE
     2. SELL
     3. NEITHER
ENTER 1, 2, OR 3
?3
GOVERNMENT ACCUSSES MCDANIEL AIRCRAFT   OF WAR - MONGERING!
```
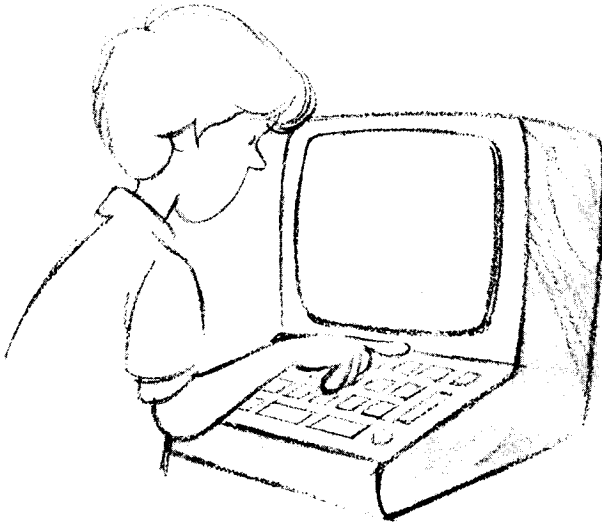
DOLLAR GAINS VALUE OVERSEAS!
WAR IN MID EAST!
PHONE RATES FROZEN BY CONSUMERS' GROUP

COMPANY	SHARES	VALUE
1. MID. OIL	45	21.32
2. SOL SEE	0	71.48
3. MC AIR	250	43.89
4. HAP MO	0	71.06
5. COM PHO	0	52.25
6. FRI ELEC	0	41.8

CASH ON HAND: 4610
VALUE OF STOCK: 11931.81
TOTAL WORTH: 16541.81
DO YOU WISH TO:
        1. PURCHASE
        2. SELL
        3. NEITHER
ENTER 1, 2, OR 3

Teach Me

PROGRAM DESCRIPTION

A fundamental demonstration of computer logic or "intelligence" is demonstrated in this program. The computer's memory is expanded by inputting questions and correct answers into the computer. You start with one question and the computer gradually builds its memory from one question to the next.

There is only one restriction in that the question must be answered with a "YES" or a "NO". In order to see the logic "tree" being developed, type in "LIST" at the beginning of each sequence. You can stop the building sequence by entering "STOP".

PROGRAM NOTES

This program has been around in many versions for quite some time. Although actual techniques vary, the result is always the construction of a "decision tree." With careful construction, the decision tree will make the computer appear to be learning. Whether or not this is true intelligence can be debated, but it is fun!

You might want to develop a method for saving the string array F$() and reading it back in again at some other time. This would let you continue an interesting "training" session.

PROGRAM LISTING: BASIC

```
100 REM TEACH ME BY GARY ORWIG
500 REM PUT MESSAGE ON SCREEN
510 PRINT
```

318

```
520 PRINT "ONE MOMENT PLEASE!"
1000 REM INITIALIZATION - MX DETERMINES MAXIMUM FILE SIZE -
- MAY INCREASE IF MEMORY PERMITS.
1010 MX=200
1020 DIM F$(MX*40)
1030 DIM FI$(40),I$(40),S$(40),SA$(40)
1040 FOR I=1 TO MX
1050 F$(I*40-39,I*40)="
    "
1060 NEXT I
1070 FOR I=1 TO 40
1080 FI$(I,I)=" ":I$(I,I)=" ":S$(I,I)=" ":SA$(I,I)=" "
1090 NEXT I
1100 F$(1*40-39,40)="YES"
1110 F$(2*40-39,2*40)="ON"
1120 F$(4*40-39,4*40)="YES"
1130 F$(6*40-39,6*40)="NO"
1140 F$(8*40-39,8*40)="EOD"
1150 REM USE FULL SCREEN
1160 POKE 82,0
1170 PRINT
2000 REM INTRODUCTION
2010 LI=24
2020 GOSUB 18000
2030 FOR I=1 TO 50
2040 PRINT "    TEACH ME!";
2050 NEXT I
2060 DE=200
2070 GOSUB 19000
2080 GOSUB 18000
2090 PRINT "THIS IS A PROGRAM WHICH ALLOWS YOU"
2100 PRINT "TO TEACH THE COMPUTER!"
2110 PRINT
2120 PRINT "THE COMPUTER STARTS WITH A QUESTION,"
2130 PRINT "AND GRADUALLY BUILDS FROM IT."
2140 PRINT
2150 PRINT "THERE IS ONLY ONE RESTRICTION IN THAT"
2160 PRINT "THE QUESTION MUST BE ANSWERED WITH"
2170 PRINT "A 'YES' OR 'NO'.  NOTHING IN BETWEEN"
2180 PRINT "IS ALLOWED!"
2190 PRINT
2200 PRINT "TO SEE THE LOGIC TREE WHICH IS"
2210 PRINT "BEING DEVELOPED, TYPE IN 'LIST'"
2220 PRINT "AT THE BEGINNING OF A SEQUENCE."
2230 PRINT
2240 PRINT "TO STOP, TYPE IN 'STOP' AT THE"
2250 PRINT "BEGINNING OF A SEQUENCE."
2260 PRINT
2270 PRINT "PUSH 'RETURN' TO CONTINUE."
2280 INPUT SA$
2290 GOSUB 18000
2300 I=0
3000 REM INPUT OPERATING PARAMETERS
3010 PRINT "GIVE ME A QUESTION TO START WITH."
3020 PRINT "LIKE 'DOES IT SWIM?'"
3030 INPUT SA$
3040 F$(3*40-39,3*40)=SA$
3050 PRINT "GIVE ME THE NAME OF SOMETHING WHICH DOES"
```

```
3060 INPUT SA$
3070 F$(5*40-39,5*40)=SA$
3080 PRINT "GIVE ME THE NAME OF SOMETHING WHICH"
3090 PRINT "DOESN'T."
3100 INPUT SA$
3110 F$(7*40-39,7*40)=SA$
4000 REM MAIN PROGRAM
4010 LI=6
4020 GOSUB 18000
4030 PRINT "TEACH ME!"
4040 LI=6
4050 GOSUB 18000
4060 B=0
4070 A=0
4080 I=1
4090 I=I+1
4100 BW=I*40-39
4110 EW=I*40
4120 IF F$(BW,BW+1)="ON" THEN 4160
4130 IF F$(BW-40,BW-38)="YES" THEN 4420
4140 IF F$(BW-40,BW-39)="NO" THEN 4420
4150 GOTO 4090
4160 L=I+1
4170 FOR I=L TO MX
4180 BW=I*40-39
4190 EW=I*40
4200 J=I
4210 IF F$(BW,BW+2)="YES" THEN 4260
4220 PRINT
4230 PRINT F$(BW,EW)
4240 PRINT
4250 NEXT I
4260 INPUT SA$
4270 IF SA$="YES" THEN 4090
4280 IF SA$="LIST" THEN 7020
4290 IF SA$="STOP" THEN 20000
4300 FOR I=J TO MX
4310 BW=I*40-39
4320 EW=I*40
4330 IF F$(BW,BW+2)="YES" THEN 4350
4340 GOTO 4370
4350 B=B+1
4360 GOTO 4400
4370 IF F$(BW,BW+1)="NO" THEN 4390
4380 GOTO 4400
4390 A=A+1
4400 IF B=A THEN GOTO 4090
4410 NEXT I
4420 PRINT
4430 PRINT "ARE YOU THINKING OF A "
4440 PRINT F$(BW,EW)
4450 INPUT SA$
4460 PRINT
4470 IF SA$="NO" THEN 4500
4480 GOSUB 12000
4490 GOTO 4030
```

```
4500 PRINT
4510 PRINT "OK, I GIVE UP!  WHAT WERE"
4520 PRINT "YOU THINKING OF?"
4530 INPUT SA$
4540 PRINT
4550 PRINT "TYPE IN A QUESTION,"
4560 PRINT "WHICH WHEN ANSWERED 'YES'"
4570 PRINT "WILL INDICATE YOU ARE THINKING OF THE"
4580 PRINT SA$
4590 PRINT
4600 I$="ON"
4610 GOSUB 6010
4620 S$=SA$
4630 L=I
4640 L=L+1
4650 INPUT SA$
4660 I$=SA$
4670 PRINT
4680 I=L
4690 GOSUB 6010
4700 I=L+1
4710 I$="YES"
4720 GOSUB 6010
4730 SA$=S$
4740 I=L+2
4750 I$=SA$
4760 GOSUB 6010
4770 I=L+3
4780 I$="NO"
4790 GOSUB 6010
4800 GOTO 4030
6000 REM SHUFFLE STACK
6010 M=I-1
6020 M=M+1
6030 IF F$(M*40-39,M*40-37)="EOD" THEN 6050
6040 GOTO 6020
6050 IF M=MX THEN 20040
6060 FOR N=M+1 TO I STEP -1
6070 F$(N*40-39,N*40)=F$((N-1)*40-39,(N-1)*40)
6080 NEXT N
6090 LN=LEN(I$)
6100 FOR Q=LN+1 TO 40
6110 I$(Q,Q)=" "
6120 NEXT Q
6130 F$(I*40-39,I*40)=I$
6140 RETURN
7000 REM PRINT THE STACK
7010 PRINT
7020 D=1
7030 FOR H=D TO D+15
7040 PRINT F$(H*40-39,H*40)
7050 NEXT H
7060 D=D+16
7070 PRINT
7080 PRINT "PRESS 'RETURN' TO"
7090 PRINT "CONTINUE LIST."
```

```
7100 PRINT "TYPE IN 'RETURN' TO RETURN TO PROGRAM."
7110 INPUT SA$
7120 IF SA$<>"RETURN" THEN 7030
7130 GOTO 4030
12000 REM REWARD
12010 LI=12
12020 GOSUB 18000
12030 PRINT "              I GOT ONE RIGHT!"
12040 GOSUB 18000
12050 DE=150
12060 GOSUB 19000
12070 GOSUB 18000
12080 RETURN
18000 REM SCROLLING
18010 FOR K=1 TO LI
18020 PRINT
18030 NEXT K
18040 RETURN
19000 REM DELAY
19010 FOR K=1 TO DE
19020 NEXT K
19030 RETURN
20000 REM CLOSING
20010 PRINT " I HOPE YOU HAD FUN!"
20020 PRINT " BYE FOR NOW!"
20030 END
20040 REM OUT OF SPACE IN STACK
20050 PRINT "YOU HAVE FILLED UP MY MEMORY!"
20060 PRINT "I'M AFRAID I HAVE TO STOP NOW."
20070 PRINT "BYE!  COME BACK AGAIN!"
20080 END
```

TABLE OF VARIABLES

MX

1010	1020	1040	4170	4300	6050

F$

1020	1050	1100	1110	1120	1130
1140	3040	3070	3110	4120	4130
4140	4210	4230	4330	4370	4440
6030	6070	6070	6130	7040	

FI$

1030	1080

I$

1030	1080	4600	4660	4710	4750
4780	6090	6110	6130		

S$

1030	1080	4620	4730

SA$

1030	1080	2280	3030	3040	3060

```
      3070   3100   3110   4260   4270   4280
      4290   4450   4470   4530   4580   4620
      4650   4660   4730   4750   7110   7120


  I
      1040   1050   1050   1060   1070   1080
      1080   1080   1080   1080   1080   1080
      1080   1090   2030   2050   2300   4080
      4090   4090   4100   4110   4160   4170
      4180   4190   4200   4250   4300   4310
      4320   4410   4630   4680   4700   4740
      4770   6010   6060   6130   6130

  LI
      2010   4010   4040   12010  18010

  DE
      2060   12050  19010

  B
      4060   4350   4350   4400

  A
      4070   4390   4390   4400

  BW
      4100   4120   4120   4130   4130   4140
      4140   4180   4210   4210   4230   4310
      4330   4330   4370   4370   4440

  EW
      4110   4190   4230   4320   4440

  L
      4160   4170   4630   4640   4640   4680
      4700   4740   4770

  J
      4200   4300

  M
      6010   6020   6020   6030   6030   6050
      6060

  N
      6060   6070   6070   6070   6070   6080


  LN
      6090   6100

  Q
      6100   6110   6110   6120

  D
      7020   7030   7030   7060   7060
```

H
```
  7030   7040   7040   7050
```

K
```
  18010  18030  19010  19020
```


PROGRAM LISTING: MICROSOFT BASIC

```
100 REM   TEACH ME BY GARY ORWIG
1000 REM    INITIALIZATION - MX DETERMINES MAXIMUM FILE SIZE
- - MAY INCREASE IF MEMORY PERMITS.
1010 MX = 200
1020 DIM F$(MX)
1030 F$(1) = "YES"
1040 F$(2) = "ON"
1050 F$(4) = "YES"
1060 F$(6) = "NO"
1070 F$(8) = "EOD"
1080 REM USE FULL SCREEN
1090 POKE 82,0
1100 CLS
2000 REM   INTRODUCTION
2010 LI = 24
2020 GOSUB 18000
2030 FOR I = 1 TO 10
2040 PRINT "    TEACH ME!";
2050 NEXT I
2060 DE = 1500
2070 GOSUB 19000
2080 GOSUB 18000
2090 PRINT "THIS IS A PROGRAM WHICH ALLOWS YOU"
2100 PRINT "TO TEACH THE COMPUTER!"
2110 PRINT
2120 PRINT "THE COMPUTER STARTS WITH A QUESTION,"
2130 PRINT "AND GRADUALLY BUILDS FROM IT."
2140 PRINT
2150 PRINT "THERE IS ONLY ONE RESTRICTION IN THAT"
2160 PRINT "THE QUESTION MUST BE ANSWERED WITH"
2170 PRINT "A 'YES' OR 'NO'.  NOTHING IN BETWEEN"
2180 PRINT "IS ALLOWED!"
2190 PRINT
2200 PRINT "TO SEE THE LOGIC TREE WHICH IS"
2210 PRINT "BEING DEVELOPED, TYPE IN 'LIST'"
2220 PRINT "AT THE BEGINNING OF A SEQUENCE."
2230 PRINT
2240 PRINT "TO STOP, TYPE IN 'STOP' AT THE"
2250 PRINT "BEGINNING OF A SEQUENCE."
2260 PRINT
2270 PRINT "PUSH 'RETURN' TO START."
2280 INPUT SA$
2290 GOSUB 18000
2300 I = 0
3000 REM   INPUT OPERATING PARAMETERS
3010 PRINT "GIVE ME A QUESTION TO START WITH."
3020 PRINT "LIKE 'DOES IT SWIM?'"
```

```
3030 INPUT F$(3)
3040 PRINT "GIVE ME THE NAME OF SOMETHING WHICH DOES"
3050 INPUT F$(5)
3060 PRINT "GIVE ME THE NAME OF SOMETHING WHICH"
3070 PRINT "DOESN'T."
3080 INPUT F$(7)
4000 REM   MAIN PROGRAM
4010 LI = 6
4020 GOSUB 18000
4030 PRINT "TEACH ME!"
4040 LI = 6
4050 GOSUB 18000
4060 B = 0
4070 A = 0
4080 I = 1
4090 I = I + 1
4100 IF F$(I) = "ON" THEN 4140
4110 IF F$(I - 1) = "YES" THEN 4360
4120 IF F$(I - 1) = "NO" THEN 4360
4130 GOTO 4090
4140 L = I + 1
4150 FOR I = L TO MX
4160 J = I
4170 IF F$(I) = "YES" THEN 4220
4180 PRINT
4190 PRINT F$(I)
4200 PRINT
4210 NEXT I
4220 INPUT SA$
4230 IF SA$ = "YES" THEN 4090
4240 IF SA$ = "LIST" THEN 7020
4250 IF SA$ = "STOP" THEN 20000
4260 FOR I = J TO MX
4270 IF F$(I) = "YES" THEN 4290
4280 GOTO 4310
4290 B = B + 1
4300 GOTO 4340
4310 IF F$(I) = "NO" THEN 4330
4320 GOTO 4340
4330 A = A + 1
4340 IF B = A GOTO 4090
4350 NEXT I
4360 PRINT
4370 PRINT "ARE YOU THINKING OF A ";F$(I);"?"
4380 INPUT SA$
4390 PRINT
4400 IF SA$ = "NO" THEN 4430
4410 GOSUB 12000
4420 GOTO 4030
4430 PRINT
4440 PRINT "OK, I GIVE UP!  WHAT WERE"
4450 PRINT "YOU THINKING OF?"
4460 INPUT SA$
4470 PRINT
4480 PRINT "TYPE IN A QUESTION,"
4490 PRINT "WHICH WHEN ANSWERED 'YES'"
```

```
4500 PRINT "WILL INDICATE YOU ARE THINKING OF THE"
4510 PRINT SA$
4520 PRINT
4530 I$ = "ON"
4540 GOSUB 6010
4550 S$ = SA$
4560 L = I
4570 L = L + 1
4580 INPUT SA$
4590 I$ = SA$
4600 PRINT
4610 I = L
4620 GOSUB 6010
4630 I = L + 1
4640 I$ = "YES"
4650 GOSUB 6010
4660 SA$ = S$
4670 I = L + 2
4680 I$ = SA$
4690 GOSUB 6010
4700 I = L + 3
4710 I$ = "NO"
4720 GOSUB 6010
4730 GOTO 4030
6000 REM  SHUFFLE STACK
6010 M = I - 1
6020 M = M + 1
6030 IF F$(M) = "EOD" THEN 6050
6040 GOTO 6020
6050 IF M = MX THEN 20500
6060 FOR N = M + 1 TO I STEP  - 1
6070 F$(N) = F$(N - 1)
6080 NEXT N
6090 F$(I) = I$
6100 RETURN
7000 REM  PRINT THE STACK
7010 PRINT
7020 D = 1
7030 FOR H = D TO D + 15
7040 PRINT F$(H)
7050 NEXT H
7060 D = D + 16
7070 PRINT
7080 PRINT "PRESS 'RETURN' TO"
7090 PRINT "CONTINUE LIST."
7100 PRINT "TYPE IN 'RETURN' TO RETURN TO PROGRAM."
7110 INPUT SA$
7120 IF SA$ <  > "RETURN" THEN 7030
7130 GOTO 4030
12000 REM  REWARD
12010 LI = 12
12020 GOSUB 18000
12030 PRINT "              I GOT ONE RIGHT!"
12040 GOSUB 18000
12050 DE = 1000
12060 GOSUB 19000
```

```
12070 GOSUB 18000
12080 RETURN
18000 REM   SCROLLING
18010 FOR K = 1 TO LI
18020 PRINT
18030 NEXT K
18040 RETURN
19000 REM   DELAY
19010 FOR K = 1 TO DE
19020 NEXT K
19030 RETURN
20000 REM   CLOSING
20010 PRINT " I HOPE YOU HAD FUN!"
20020 PRINT " BYE FOR NOW!"
20030 END
20500 REM   OUT OF SPACE IN STACK
20510 PRINT "YOU HAVE FILLED UP MY MEMORY!"
20520 PRINT "I'M AFRAID I HAVE TO STOP NOW."
20530 PRINT "BYE!   COME BACK AGAIN!"
20540 END
```

TABLE OF VARIABLES

A
4070 4330 4330 4340

B
4060 4290 4290 4340

D
7020 7030 7030 7060 7060

DE
2060 12050 19010

F$(*)
1020 1030 1040 1050 1060 1070
3030 3050 3080 4100 4110 4120
4170 4190 4270 4310 4370 6030
6070 6070 6090 7040

H
7030 7040 7050

I
2030 2050 2300 4080 4090 4090
4100 4110 4120 4140 4150 4160
4170 4190 4210 4260 4270 4310
4350 4370 4560 4610 4630 4670
4700 6010 6060 6090

I$
4530 4590 4640 4680 4710 6090

J
4160 4260

K
18010 18030 19010 19020

L
4140 4150 4560 4570 4570 4610
4630 4670 4700

LI
2010 4010 4040 12010 18010

M
6010 6020 6020 6030 6050 6060

MX
1010 1020 4150 4260 6050

N
6060 6070 6070 6080

S$
4550 4660

SA$
2280 4220 4230 4240 4250 4380
4400 4460 4510 4550 4580 4590
4660 4680 7110 7120

END OF VAR. LIST

SAMPLE RUN

THIS IS A PROGRAM WHICH ALLOWS YOU
TO TEACH THE COMPUTER!

THE COMPUTER STARTS WITH A QUESTION,
AND GRADUALLY BUILDS FROM IT.

THERE IS ONLY ONE RESTRICTION IN THAT
THE QUESTION MUST BE ANSWERED WITH
A 'YES' OR 'NO'. NOTHING IN BETWEEN
IS ALLOWED!

TO SEE THE LOGIC TREE WHICH IS
BEING DEVELOPED, TYPE IN 'LIST'
AT THE BEGINNING OF A SEQUENCE.

TO STOP, TYPE IN 'STOP' AT THE
BEGINNING OF A SEQUENCE.

PUSH 'RETURN' TO START.
?

```
GIVE ME A QUESTION TO START WITH.
LIKE 'DOES IT SWIM?'
?DOES IT FLY?
GIVE ME THE NAME OF SOMETHING WHICH DOES
?BIRD
GIVE ME THE NAME OF SOMETHING WHICH
DOESN'T.
?CAT


TEACH ME!


DOES IT FLY?

?YES

ARE YOU THINKING OF A BIRD?
?NO


OK, I GIVE UP!  WHAT WERE
YOU THINKING OF?
?AIRPLANE

TYPE IN A QUESTION,
WHICH WHEN ANSWERED 'YES'
WILL INDICATE YOU ARE THINKING OF THE
AIRPLANE

?DOES IT CARRY PEOPLE?

TEACH ME!


DOES IT FLY?

?YES

DOES IT CARRY PEOPLE?

?NO

ARE YOU THINKING OF A BIRD?
?YES


          I GOT ONE RIGHT!


TEACH ME!


DOES IT FLY?

?NO
```

```
ARE YOU THINKING OF A CAT?
?NO


OK, I GIVE UP!  WHAT WERE
YOU THINKING OF?
?DOG

TYPE IN A QUESTION,
WHICH WHEN ANSWERED 'YES'
WILL INDICATE YOU ARE THINKING OF THE
DOG

?DOES IT BARK?

TEACH ME!


DOES IT FLY?

?LIST
YES
ON
DOES IT FLY?
YES
ON
DOES IT CARRY PEOPLE?
YES
AIRPLANE
NO
BIRD
NO
ON
DOES IT BARK?
YES
DOG
NO

PRESS 'RETURN' TO
CONTINUE LIST.
TYPE IN 'RETURN' TO RETURN TO PROGRAM.
?RETURN
TEACH ME!


DOES IT FLY?

?STOP
 I HOPE YOU HAD FUN!
 BYE FOR NOW!
```

SOUND AND GRAPHIC SUBROUTINES

Two of the most exciting attributes of the Atari home computers are their abilities to produce sound and color graphics. Unfortunately, it would require another whole book to properly treat these two areas. However, since sound and graphics can add so much to computer-assisted instruction, the authors of this book felt it important to encourage you to explore these areas. Graphics and sound are most easily added to the reward and wrong-answer feedback areas. The following routines have been written with this in mind, and for the most part they can be directly substituted into any of the programs. Just drop the 12,000s or 14,000s from one of the programs and put one of these subroutines in either place. As you gain confidence, you can try combining both graphics and sound for really interesting results.

These routines merely touch the surface of the potential for sound and graphics. If you get interested, check with your dealer for a good book or two that really go into the details.

```
100 REM RANDOM NOTES - PITCH AND DURATION VARY
110 REM MAIN PROGRAM AREA
120 REM GO TO SUBROUTINE
130 GOSUB 12000
140 REM CONTINUE WITH PROGRAM
150 REM IN THIS CASE, END.
160 END
12000 REM RANDOM NOTES
12010 FOR J=1 TO 20
12020 SOUND 0,RND(0)*255,10,10
12030 FOR I=1 TO (RND(0)*4+1)*40
12040 NEXT I
12050 NEXT J
12060 SOUND 0,0,0,0
12070 RETURN
```

```
100 REM MUSICAL SCALE
110 REM THIS IS AN ATTENTION GETTING UP AND DOWN SCALE SOUND
120 REM MAIN PART OF PROGRAM
130 REM GOTO SUBROUTINE
140 GOSUB 12000
150 REM CONTINUE WITH PROGRAM
160 REM IN THIS CASE, END
170 END
12000 REM UP AND DOWN TONES
12010 FOR I=255 TO 1 STEP -15
12020 SOUND 0,I,10,10
12030 FOR J=1 TO 20:NEXT J
12040 NEXT I
12050 FOR I=1 TO 255 STEP 15
12060 SOUND 0,I,10,10
12070 FOR J=1 TO 20:NEXT J
12080 NEXT I
12090 SOUND 0,0,0,0
12100 RETURN
```

```
100 REM BUZZ ROUTINE
110 REM JUMP TO WRONG ANSWER ROUTINE
120 REM TO PRODUCE AN UNPLEASANT BUZZ.
130 REM MAIN PART OF PROGRAM
140 GOSUB 14000
150 REM CONTINUE WITH PROGRAM
160 REM IN THIS EXAMPLE, END
170 END
14000 REM BUZZ
14010 SOUND 0,60,12,15
14020 SOUND 1,58,12,15
14030 FOR I=1 TO 200
14040 NEXT I
14050 SOUND 0,0,0,0
14060 SOUND 0,0,0,0
14070 RETURN
```

```
100 REM MUSIC
110 REM BE CAREFUL WITH THE DATA STATEMENTS.
120 REM YOU WILL HAVE TO USE 'RESTORE'CAREFULLY
130 REM IF THERE ARE OTHER DATA SATEMENTS IN THE PROGRAM.
140 REM GO TO THE SUBROUTINE
150 GOSUB 12000
160 REM CONTINUE WITH PROGRAM
170 REM IN THIS CASE END
180 END
12000 REM MUSIC
12010 RESTORE 12140
12020 V=V+1
```

```
12030 IF V=5 THEN RETURN
12040 READ N1,N2,N3,N4,L
12050 IF N1=999 THEN GOTO 12010
12060 L=L*40
12070 IF V>0 THEN SOUND 0,N1,10,14
12080 IF V>1 THEN SOUND 1,N2,10,14
12090 IF V>2 THEN SOUND 2,N3,10,14
12100 IF V>3 THEN SOUND 3,N4,10,14
12110 FOR I=1 TO L
12120 NEXT I
12130 GOTO 12040
12140 DATA 121,96,81,60,1,96,81,60,47,1,81,60,47,40,1,60,47,
40,29,2,81,60,47,40,1,60,47,40,29,6
12150 DATA 0,0,0,0,6,999,999,999,999,999
```

```
100 REM LARGE TEXT REWARD ROUTINE
110 REM MAIN PROGRAM AREA
120 REM GO TO SUBROUTINE
130 GOSUB 12000
140 REM CONTINUE WITH PROGRAM
150 REM IN THIS EXAMPLE, END
160 END
12000 REM LARGE TEXT REWARD
12010 GRAPHICS 2+16
12020 POSITION 4,5
12030 PRINT #6;"VERY GOOD!"
12040 FOR I=1 TO 1000:NEXT I
12050 GRAPHICS 0
12060 RETURN
```

```
100 REM HAPPY FACE
110 REM MAIN PROGRAM AREA
120 REM GO TO THE SUBROUTINE
130 GOSUB 12000
140 REM CONTINUE PROGRAM
150 REM IN THIS CASE, END
160 END
12000 REM FACE
12010 GRAPHICS 7+16
12020 COLOR 1
12030 FOR A=1 TO 7.5 STEP 0.05
12040 PLOT (80+SIN(A)*20),(40+COS(A)*20)
12050 NEXT A
12060 PLOT 70,33:PLOT 71,33:PLOT 89,33:PLOT 90,33
12070 PLOT 79,40:PLOT 81,40:PLOT 80,39
12080 PLOT 70,46
12090 DRAWTO 80,50
12100 DRAWTO 90,46
12110 FOR I=1 TO 2000:NEXT I
```

```
12120 GRAPHICS 0
12130 RETURN




100 REM SAD FACE
110 REM MAIN PROGRAM AREA
120 REM GO TO THE SUBROUTINE
130 GOSUB 12000
140 REM CONTINUE PROGRAM
150 REM IN THIS CASE, END
160 END
12000 REM SAD FACE
12010 GRAPHICS 7+16
12020 COLOR 3
12030 FOR A=1 TO 7.5 STEP 0.05
12040 PLOT (80+SIN(A)*20),(40+COS(A)*20)
12050 NEXT A
12060 PLOT 70,33:PLOT 71,33:PLOT 89,33:PLOT 90,33
12070 PLOT 79,40:PLOT 81,40:PLOT 80,39
12080 PLOT 70,50
12090 DRAWTO 80,46
12100 DRAWTO 90,50
12110 FOR I=1 TO 2000:NEXT I
12120 GRAPHICS 0
12130 RETURN




100 REM GRAPHICS ROUTINE
110 REM MAIN PART OF PROGRAM
120 REM JUMP TO SUBROUTINE
130 GOSUB 12000
140 REM CONTINUE WITH PROGRAM
150 REM IN THIS CASE, STOP
160 END
12000 REM SPIRALS, ETC
12010 PI=3.14159:W=PI/180
12020 D=RND(0)*20
12030 ANG=RND(0)*360
12040 I=RND(0)*20
12050 GRAPHICS 8+16:COLOR 1
12060 SETCOLOR 2,RND(0)*16,INT(RND(0)*4)*2
12070 X=140:Y=96:A=ANG:PLOT X,Y
12080 FOR J=1 TO 200
12090 XN=X+D*COS(W*A):YN=Y+D*SIN(W*A)
12100 IF XN<0 OR YN<0 THEN 12150
12110 IF XN>319 OR YN>191 THEN 12150
12120 DRAWTO XN,YN:D=D+I
12130 A=A+ANG:X=XN:Y=YN
12140 NEXT J
12150 FOR I=1 TO 400:NEXT I
12160 GRAPHICS 0
12170 RETURN
```

Address. A number that designates a location where information is stored in a memory device.

Algorithm. A statement of mathematical and/or logical steps to be followed in the solution of a problem.

ASCII. American Standard Code for Information Interchange. A standard set of binary codes which represent letters, numbers, and symbols.

BASIC. Beginners All-Purpose Symbolic Instruction Code. A high-level conversational programming language in widespread use. Incorporates simple English words and common mathematical symbols.

Baud. A rate of data transfer, given in bits per second. Alphabetic characters usually require about 10 bits per character, so a baud rate of 300 corresponds to about 30 characters per second.

Binary Code. The most fundamental of codes, using only 0's and 1's to represent data. Can be represented by the presence or absence of electrical current within key parts of a computer.

Branching Programmed Instruction. The material to be learned is presented in a sequence of small steps or frames similar to linear programmed instruction. The learner is presented a paragraph or so of information and asked questions concerning the paragraph. A correct answer advances or branches the program to the next step, where the learner's correct answer is verified and further information in paragraph form is presented. If the answer is incorrect or a near miss, the learner is transferred to a frame which explains the point in elementary or remedial terms. The learner is then sent back to the original point or frame to begin the advancement or branching process once again.

Bus. The set of electrical lines connecting the various parts of the computer. Data and control signals are sent along these lines.

Byte. A basic unit of information in a computer. A byte usually represents one character and is normally eight bits in length.

CAI. Computer-Assisted (Aided or Administered) Instruction. Many times CAI can be also referred to as CAL (computer-assisted learning) or CBL (computer-based learning). An *extrinsic* programming technique for individual instruction using computer hardware and software.

Character. Letters, numbers, and symbols which can be arranged into information. A character can usually be defined as one byte of information.

Computer Literacy. Knowledge or awareness of how computers are operated, programmed, and applied as an object of instruction.

Courseware. The terms *course* and *software* combined. The material to be learned is written in a computer programming language such as BASIC or PILOT.

CPU. Central Processing Unit. The "brain" of the computer. Directs all functions of the computer.

CRT. Cathode Ray Tube. The tube which makes the television screen perform. Used to display text and graphics created by a computer. Frequently linked with a keyboard to create a CRT terminal.

Cursor. A movable spot on the face of a CRT with indicates where the next character will be displayed.

Data. Information transferred to or from a computer.

Debug. The process of locating and eliminating errors in a program listing.

Dialog. A type of computer-assisted instruction (CAI) that is least used. Software is complex and requires a great deal of data storage capability. Instruction begins with the learner submitting questions or data to the computer. The computer replies with correct answers and additional information on the subject(s) and even provides practice problems. Dialog CAI is not very practical with present microcomputers because of the lack of data storage capability.

Diagnostic Routine. A form of programming which lets the computer test itself for internal hardware malfunctions.

Disc (Disk). A mass storage device capable of high storage and retrieval speeds. Similar in appearance to a magnetic oxide coated record. Can be either *floppy* (flexible) or *hard,* depending upon performance requirements.

Dot Matrix. A technique of using an array of dots to create characters. A 5 × 7 array of dots is the bare minimum for alphanumeric characters, while larger arrays, such as 7 × 9, will allow upper and lower case letters, and underlining.

Drill and Practice. A type of computer-assisted instruction (CAI) that is used most widely by educators. Material is presented in form of practice problems and exercises for the purpose of learning reinforcement. Computer provides student reward and recognition for correct answers and remedial information for wrong answers. Excellent for present microcomputer hardware.

Duplex (Full Duplex). An interface which allows simultaneous two-way communication between a computer and a peripheral device.

EPROM. Erasable Programmable Read Only Memory. A long-term memory which, under special conditions, can be erased and rewritten.

File. A set of data which has some specified relationship.

Firmware. Programs which are stored in ROM. They are immediately available for execution; there is no need to load them from a storage device.

Floating Point BASIC. A full-sized BASIC programming language capable of handling a complete range of mathematic computations. It also includes sophisticated methods for manipulating words or "strings" of non-numeric characters.

GIGO. Garbage In, Garbage Out. Any errors which enter a computer will result in errors in the output.

Graphics. The ability of the computer to construct line drawings, graphs, charts, etc. on a CRT or a printer.

Graphic Subroutine. A small segment of a program listing that performs a specific graphic function. Graphic subroutines can substitute word subroutines in order to draw or plot a graphic design to depict the meaning of the word.

Hardware. The equipment which makes up a computer system.

High-Level Language. A computer language with characteristics of English words, decimal arithmetic, and common mathematics symbols. Each instruction usually represents many individual computer operations.

Input. Information (or data) entering a computer or peripheral device. The same information may be *output* from some other part of the computer system.

Interface. A hardware and/or software device used to connect a computer to peripheral equipment such as printers.

I/O. Input/Output of information. The two terms are frequently used together because they often involve the same communication lines.

K or Kilo. Symbol or prefix for 1,000. In computer language, 1 K actually stands for 2 to the tenth power or 1,024.

Linear Programmed Instruction. Material to be learned is presented in a logical (fixed) sequence of small steps or frames. Immediate confirmation of correct or incorrect answers is given and student progresses onto the next frame at his or her own rate. Correct answer must be given before the learner advances onto the next step or frame.

LOGO. A programming language developed by Seymour Papert with MIT (Massachusetts Institute of Technology) associates by which children can learn computer programming, problem solving, and mathematics while using the computer. Children are typically introduced to LOGO by using the computer to control a "TURTLE," an imaginary creature that "lives" on a graphics display screen, the movement of which is controlled by commands typed at a computer keyboard.

Machine Language. A language which can be executed directly by the computer. Usually a series of binary or hexdecimal numbers. Very difficult for humans to work with.

Memory. The high speed electronic components in a computer that store information often in RAM or ROM.

Modem. Modulator-Demodulator. An interface that allows the computer to send (receive) digital signals over analog signal telecommunication lines or satellites.

Output. Information or data coming from a computer.

Peripheral Device. Equipment that links to a computer by means of an interface. Printers, CRT's, tape and disc drives are examples.

PILOT. A high-level programming language using interaction and conversation techniques. Developed by Dr. John Starkweather at the University of California, San Francisco.

Programmed Instruction (PI). Material to be learned is presented in short sequential steps or frames. Each frame represents a fact to be learned. A dialog in the form of questions and answers is set up between a single tutor and a single learner.

PROM. Programmable Read Only Memory. Permanently recorded data stored on special RAM memory. Once programmed the data cannot be altered by computer or man. Useful for storing frequently utilized instructions.

RAM. Random Access Memory. The "working" memory of the computer. This memory can be accessed and altered (programmed) by the computer or man as needed.

REM. A REMarks statement in a program listing. It is used to explain a portion of the program and does not have to be entered into the computer's memory.

ROM. Read Only Memory. About the same as PROM, except that ROM is usually programmed at the time of manufacture. Many times in the form of cassette or cartridges. ROM cannot be altered (programmed) by the computer or man.

Simulation Programmed Instruction. A type of programmed instruction (PI) and computer-assisted instruction (CAI) that puts the learner in a real-life physical or social situation. Simulations are designed to allow the learner to use decision-making skills to alter the situation and witness the outcome created by the decisions. Personal, educational growth derives from the parallel effect of the various inputs to real-life conditions. A great deal of enthusiasm or motivation from the learner is one good aspect of the use of simulation CAI. Many computer games (for example, Space War games) are simulations. Science and engineering as well as the aerospace industry use simulations for structural design and the training of personnel. Simulations are difficult to create, but they have tremendous potential for use on present microcomputers.

Software. Programs and necessary documentation which are needed to make a computer operate.

Testing. A type of computer-assisted instruction (CAI) that educators first used on a computer. Computer gives a "test" by asking questions while the learner responds with the correct or incorrect answer. A score is recorded by the computer and a grade is displayed at the end of the test. Microcomputers are good application for this type of CAI.

Tutorial. A type of computer-assisted instruction (CAI) that is the second most widely used application by educators. Linear, branching, or simulation programmed

instruction is implemented on a computer. Microcomputers are widely used for this type of CAI.

Terminal. A peripheral device which usually consists of a printer or a CRT, a keyboard, and sometimes a floppy or hard disc device.

Appendix C

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