

**PET PROGRAMS
FOR THE
SAN FRANCISCO STATE
UNIVERSITY
CENTER FOR
MATHEMATICAL
LITERACY**

The Pet Shop is located in Physical Sciences 125. This library of programs is supported there by a Nestar Cluster/One disk system. There are also Pets with taped versions of the programs in the Math Lab, Physical Sciences 404.

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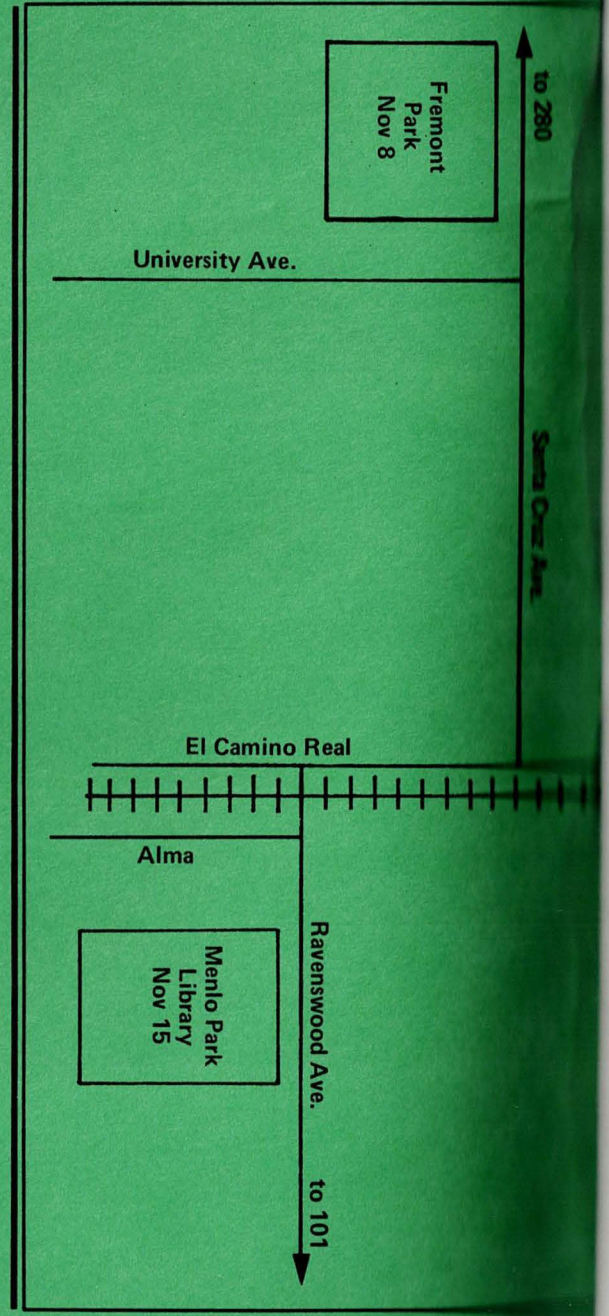
Thanks to Pete Rowe of the Lawrence Hall of Science and Ed Herstein of the University of Michigan for the many programs they contributed.

And many thanks to Diane Resek, director of the project at SFSU, without whose support and encouragement, none of this would have happened.

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* These asterisked programs may be copied.

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MADLIB

1

You supply some keywords and the PET makes any one of four different stories from them. Eleven adjectives, five adverbs, ten nouns and a few miscellaneous names make for some hilarious fun. Each time you ask for a given story, the words are put in different places.

Excellent for getting the idea of kinds of words and why some words work better in certain places than others.

SUBJECT AREAS
Words

HANGMAN

2

This is an interesting version of the classic game in which you get to choose the category of word you want. As you miss letters a condemned man walks up some stairs toward the gallows. A little gruesome!

This game is a good introduction to interaction with a computer.

SUBJECT AREAS
Words

BALLOON

3

A vertical number line is drawn on the right hand side of the screen. The bottom of the line is labelled zero and the top, one. A small balloon is positioned somewhere between. Your object is to pop the balloon by giving a decimal number between zero and one. When you do, a dart flies across the screen and sticks to the line, possibly popping the balloon.

This is a good way to become more familiar with decimals.

This program needs some improving:

- better directions
- keep score
- vary the limits
- print the guesses out
next to the dart

SUBJECT AREAS

Numbers, Drill and Practice

AUTHOR: Unknown, obtained from LHS

MAXIT

4

This is an excellent strategy game in which you play against the PET. An eight by eight grid is filled with positive and negative integers. You and the PET take turns taking numbers. You can take any number in the row that the last number was in and the PET can take any number in the column that the last number was in. The game ends when a player cannot move (usually when all the numbers are gone), and the one with the most points wins.

The computer is a good player and hard, but not impossible, to beat. This game is just as fun for two humans, and teaches a lot about strategy and numbers.

The instructions and the graphics are excellent.

SUBJECT AREAS

Strategy Games

AUTHOR: Harry Saal, Copyright, 1978

PPong

5

This is a video game in which a ball is bouncing around in a box. By placing deflectors in front of the ball, you can alter its course so that it will hit the target. When the target is hit, you get a point and a new target appears in a new place. All is well, except that landmines appear every so often, and hitting one of these ends the game.

Deflectors are placed with the 'n' and 'm' keys. The graphics characters above them show you the orientation of the deflector. You can also clear away deflectors with the space key.

This is an exciting and learning-filled game with good graphics and instructions.

SUBJECT AREAS

Video Games

AUTHOR: Pete Rowe, LHS

Original idea, D. Waxmann

SNAKE

6

In this wonderful video game, you and another player (which may be the computer) are each in control of the motion of the head of an ever-elongating snake. Your object is to not be the one to run into a wall or any cell occupied by a snake, including your own. The movement of the snakes starts slowly and gradually gets faster. It is possible also to have the computer control both snakes and simply watch the interesting patterns which develop.

There are several additional options available for the two-human game. You can have "blasters" which allow you to fire a fast bullet in the direction you are aimed. If this bullet hits the head of your opponent, you win. If it hits the body of a snake, a hole is made. Also, you can play the game without the elongating tails. This makes it into a game of Space War.

SUBJECT AREAS

Video Games

AUTHOR: Pete Rowe, LHS

BALANCE

7

This is a computer version of an old puzzle in which you are given 12 weights all of which are identical except one. You do not know whether that one is heavier or lighter than the others. You also have an equal arm balance. The object is to find the unequal weight in just three weighings.

This version of the puzzle using the computer makes the whole thing a little more real since the PET has actually chosen the discrepant weight. This may make the puzzle accessible to some for whom the usual form is still too abstract.

The instructions are very clear and the program is easy to use. The graphics are quite good.

SUBJECT AREAS

Strategy Games, Logic

AUTHOR: John Quick, LHS

SNOOPY

8

This is a very nice drill and practice program using signed numbers. You have to compute the signed distance between you and the Red Baron on a horizontal number line. If you are wrong or are too slow, then the Red Baron hits you. A wonderful picture of Snoopy as the Red Baron appears and every time you get hit a hole appears in the dog house.

SUBJECT AREAS

Numbers, Drill and Practice

AUTHOR: Brad Compton

Copyright, 1978

BRAIN STRAIN

9

A 3x3 grid appears with the numbers 1 through 9. Some of the squares are lit and some are not. Your job is to get them all lit except the middle one.

You do this by choosing one of the lit squares. This will reverse the color of some of the squares according to the scheme below:

- 1 reverses 1, 2, 4, 5
- 2 reverses 1, 2, 3
- 3 reverses 2, 3, 5, 6
- 4 reverses 1, 4, 7
- 5 reverses 2, 4, 5, 6, 8
- 6 reverses 3, 6, 9
- 7 reverses 4, 5, 7, 8
- 8 reverses 7, 8, 9
- 9 reverses 5, 6, 8, 9

A timer keeps track of how long it is taking you to solve this interesting puzzle.

SUBJECT AREAS

Strategy Games, Logic

AUTHOR:

WUMPUS

10

As in QUEST, you are exploring a system of caves. In one of the caves is the Wumpus. The only way out of the caves is for you to shoot the Wumpus with one of your limited number of arrows. But be careful, if you miss the Wumpus, he wakes up and moves to another cave, in which case he may come to your cave and then its all over.

Also watch out for the bottomless pit and the Superbats which pick you up and move you to another cave at random.

The system of caves is topologically like the vertices of a dodecahedron, the twelve-faced solid made from pentagons. You quickly find it helpful to draw yourself a map of where you have been. Since warnings are printed when you are close to the Wumpus, the bottomless pit, or the Superbats, you learn to make inferences about where they are rather than trusting purely to luck.

A wonderful program with some nice graphics thrown in.

SUBJECT AREAS

Simulations, Geometry

AUTHOR: Unknown, obtained from LHS

BEANS

11

A large jar appears on the screen which is gradually filled up with beans. You are asked to guess how many beans are in the jar. You are told whether your guess is too high or too low until you finally get it. Each time you play the jar has a different number of beans.

This is an excellent way to practice estimating numbers. It should be accompanied by a real jar with real beans for guessing.

Good instructions and graphics.

SUBJECT AREAS

Numbers

AUTHOR: Brad Compton
Copyright, 1978

DARTS

12

This is a drill and practice game for one or two players. A large target appears on the screen and players take turns answering arithmetic questions which appear below the target. The closer the answer, the greater the score. Only a certain time is given, so it pays to get good at estimating the answers to the hard questions. You can choose the kind of problem and the level of difficulty.

A good version of this drill and practice genre.

SUBJECT AREAS

Numbers, Drill and Practice

AUTHOR: Brad Compton
Copyright, 1978

GOMOKU

13

Played on a 9x9 board, this ancient strategy game is like Tic-Tac-Toe except that the object is to get five in a row instead of three. You play against the computer and you get to choose whether you want to go first or not.

The computer plays an excellent game and is difficult to beat. An improvement to the program would be to allow less smart versions to be played. The main disadvantage is that it takes PET a long time to decide on the next move.

The traditional game has a few extra rules and is played on a larger (19x19) board which makes for more interesting strategies. This program makes a good introduction to the game.

SUBJECT AREAS

Strategy Games

AUTHOR: Unknown, obtained from LHS

OSERO

14

Osero or Othello is a classic Japanese game which has recently become very popular in this country. The game is played on an 8x8 board with chips that are black on one side and white on the other. Each of the two players takes turns putting down chips with their color up. On each move, you must trap at least one of the opponent's color between your new chip and an old one of yours. The trapped chips flip over to your color. The game is over when all the squares are occupied and the winner is the one with the most of his/her color showing.

The strategies to this game are quite subtle, being more positional than trying to get the most of your color in the early part of the game. In fact, getting too many of your color early on usually spells disaster.

The computer plays a very good game, though once you have beaten it a few times you will only want to play humans from then on. An excellent way to learn and practice this game in the beginning and early intermediate stages.

SUBJECT AREAS

Strategy Games

AUTHOR: Unknown, obtained from LHS

STAR TREK

15

This is a version of a by now classic computer game. You are in command of the Starship Enterprise charged with ridding the galaxy of Klingon warships. You have at your disposal a warp drive, long and short range sensors, torpedoes, phaser banks, and a computer library that keeps track of the parts of the galaxy you have explored. There are Starbases for you to pull into to be refueled.

The commands are:

- 1 Warp Engines
- 2 Short Range Sensors
- 3 Long Range Sensors
- 4 Phasers
- 5 Photon Torpedoes
- 6 Galactic Records
- 7 List commands

When asked for a direction, type in a number from 1 to 8.9. 1 means to the right. 3 means up. 5 means to the right. And 7 means down.

STAR TREK is wonderful fun and teaches a lot about coordinate systems, angles, and using maps.

SUBJECT AREAS

Simulations

AUTHOR: Unknown, obtained from LHS

GUESS

16

This is an especially nice version of the old game of trying to guess the number the computer is thinking of. After each guess, the PET shows you with a number line which numbers are left to be guessed. In this way, an inexperienced learner is led easily to develop an efficient search strategy.

Some improvements would be to allow a range of difficulty so that negative numbers and decimals might be hidden.

SUBJECT AREAS

Numbers

AUTHOR: Unknown, obtained from LHS

IN-OUT MACHINE

17

You feed a number into the machine and another number comes out. Your object is to figure out the rule. The graphics of the machine are stupendous and you get to choose how difficult a rule you want. The most difficult rules are quite hard.

An excellent program to develop an intuitive feel for how functions work.

After you have been able to correctly predict what comes out, you can ask the PET for its rule by typing R instead of a number.

SUBJECT AREAS

Numbers, Algebra

AUTHOR: Pete Rowe

Copyright, 1978

BREAKOUT

18

This is a PET version of a popular video game. You have a paddle whose position you control with the number keys. A ball comes moving toward your end of the board. You must deflect it back with your paddle. It then hits against a multi-layer barrier and comes bouncing back to you, having chipped away a piece of the barrier. The object is to completely demolish the barrier. If you miss the ball, it disappears off the screen and you are served another until you have used up eight balls.

This game requires fine coordination to control the paddle and it feels a little unnatural, unlike using knobs or joysticks as one does with the video game versions. Nevertheless, a thoroughly enjoyable and challenging game.

SUBJECT AREAS

Video Games

AUTHOR: Unknown, obtained from LHS

SINNERS

19

A 5x5 board is filled with 3 fiends, 21 sinners and 1 blank space. You are in control of the sinners and the computer is in control of the fiends. On each of your moves you move one of the sinners into an adjacent blank space. On the computer's turn, it moves one of the fiends to an adjacent sinner and "eats" it. Your object is to lure the fiends into a straight horizontal or vertical line. You lose if this is not the case and none of the fiends can move.

This is a good beginning strategy game where beating the computer is not too difficult. The graphics are excellent and anytime you want to see the instructions you can type "H" for Help.

SUBJECT AREAS

Strategy Games

AUTHOR: Mac Oglesby
Copyright, 1978

COMBINATION WARS

20

If computer graphics can make learning your multiplication facts interesting, this program should do it. Complete with coded messages, a picture of the Starship Enterprise and torpedoes, this program goes all out to disguise its drill-and-practice function.

At the end of a series of multiplication facts, the PET tells you a score based not only on how many you got right, but how long it took you.

A needed improvement to this program would be to make it possible to choose different arithmetic processes besides addition and to choose different levels of difficulty.

SUBJECT AREAS

Numbers, Drill and Practice

SYMMETRY

21

A wonderful way to explore the concepts of symmetry, reflection, and rotation, this program by Arthur Luehrmann of the Lawrence Hall of Science allows you to make drawings and then have the PET symmetrize them in various ways; or have the PET symmetrize your drawings as you make them; or have the PET make a drawing and then symmetrize it; or, finally, have the PET make a drawing and symmetrize it simultaneously.

The program gives you excellent control over what you want to happen. Sometimes startling results are obtained from the simplest of starting points, raising many questions in the user's mind about how symmetry works.

SUBJECT AREAS

Graphics

AUTHOR: Arthur Luehrmann
Copyright, 1978

FRACTION PRACTICE

22

Normally, computers don't like to work with fractions. This program creates fraction arithmetic problems for you and checks your answers to see if they are correct and if they are reduced to lowest terms. You specify the largest denominators to be used--this determines the difficulty of the problems that come out.

When you are finished, some statistics are displayed. For each arithmetic process which you worked on, the percent correct and the time per problem are shown.

Except for the fact that it can work with fractions, this is a typically dull drill and practice program.

SUBJECT AREAS

Numbers, Drill and Practice

AUTHOR: Bill Finzer
Copyright, 1978

ETCH

23

This program is similar to "DRAW" in that it enables you to create pictures on the PET screen using PET graphics. Since it is useful to have a list of commands on paper while you use this program, here they are.

The number keys are held down to move the brush across the screen:

- 1 - lower left
- 2 - down
- 3 - lower right
- 4 - left
- 5 - picks pen up
- 6 - right
- 7 - upper left
- 8 - up
- 9 - upper right

B - to change brush stroke

W - to change brush width

E - to erase and then E again to get back to same

brush

C - to change one character to another over the whole

screen

N - number for saving as a program

K - for single key mode

F - when finished with picture

S - to save on tape

L - to load picture from tape

SUBJECT AREAS

Graphics

AUTHOR: Bill Finzer

URNSUM

24

Suppose you cut up four small squares of cardboard and write numbers on them and put them in an urn. Now you draw out two of the numbers and add them together. If the numbers were 3, 5, 5, and 2, what are your chances of getting a sum of 10? If you are interested in such questions, this program will help you find the answers.

You get to decide how many numbers will go in the urn and what will be their values. You also get to decide how many numbers will be drawn at once. Then the program does a complete calculation of how many ways there are of getting the various possible sums.

If the number of possible sums is quite large, the program has to do some grouping in order to be able to show them all.

SUBJECT AREAS

Probability

Author: Rick Marks

GRIBBET

25

This is a fun little Video Game in which the Gribbet is hiding somewhere on the screen. The PET will help you find it by blinking your cursor faster, the closer you are to it. When you land where the Gribbet is, you get a brief view and then another try at catching it. Each time you play the Gribbet moves around faster than it did the time before.

Nice graphics and easy rules make this a good introductory video game. The search strategies for finding the Gribbet can actually become fairly involved when the Gribbet is moving very fast.

SUBJECT AREAS

Video Games

AUTHOR: Bill Finzer

LIFE

26

This is a simulation of a biological community of micro-organisms that live and die from generation to generation according to some very simple rules. You get to lay down the initial pattern of organisms (represented by X's and O's) and the PET shows you succeeding generations.

The rules for living and dying are as follows:

1. If an organism has fewer than two neighbors of its own kind, it dies of loneliness.
2. If an organism has more than three neighbors of its own kind, it dies of over-crowding.
3. If an empty cell has exactly three neighboring cells with live beasties of one kind, it gives birth to a new beastie of that kind.
4. If an organism has two or more neighbors of the other kind, it dies.
5. Neighbors are horizontal, vertical, or diagonal.

By pressing M for manual, the generations change a half-step at a time, showing you which organisms are about to die and where new ones are about to be born. By pressing a number key, the generations will step along with that number of seconds delay between.

A nice game for two people can be played where one uses the X's and the other uses the O's. They each start out with a pattern of organisms (say 5 each); then after each generation, they get to add three more of their kind. This makes you think very hard about how the rules work.

SUBJECT AREAS

Simulations

AUTHOR: Bill Finzer

DRAW POKER

27

The PET is the dealer offering you odds on various poker hands. You place your bet and are then dealt a hand and offered a chance to stand or draw. The odds are payed on the resulting hand.

The graphics are good, but since no payoff happens for any hand worse than two pair, it is hard to win at all. Also you are not competing against the PET but only against the odds. Nevertheless, one learns something about probability and the likelihood of certain events.

SUBJECT AREAS

Games of Chance

AUTHOR: Dave Howe

MASTERMIND

28

This is a computer version of the popular game for two. Either the computer or you thinks of a sequence of numbers or letters and the other of you tries to figure out what they are by making guesses. Clues are given to tell you how many are in the right place and how many are correct but in the wrong place.

The computer is able to guess correctly in surprisingly few moves, but it can take a long time to find its next guess.

The graphics are a little confusing at first, but all in all, a good and versatile program.

SUBJECT AREAS

Strategy Games

AUTHOR: Valerie Colber
Copyright, 1978

FRACTION TARGET

29

A horizontal number line is drawn near the bottom of the screen and a target consisting of a stack of balls appears somewhere along it. A boy is ready to push a ball along to the place you specify by giving a fraction and then dropping the ball to see if you hit the target or not.

The animation in this program is quite enjoyable to watch. A lot of intuitive feel can be gained for fractions, especially since the scale on the number line changes at random. The PET also keeps score both in absolute numbers and in percentages.

Fractions are input just as they are written, for example one and three-fourths is given to the PET as $1 \frac{3}{4}$.

SUBJECT AREAS

Numbers, Drill and Practice

AUTHOR: Bill Finzer

Copyright, 1978

WORD-IN-OUT

30

This program creates In-Out machines with words as inputs and either numbers or letters as outputs. (Compare this to the In-Out Machine program.) Your task is to figure out the machine's rule.

Instructions are given with the program. Basically, you are given a table showing six in words and their outputs. Then you are given a new in word and asked to predict the output. If you are wrong you will be shown the correct response and, in any event, the correct pairing will be entered in the table. If you can get two correct in a row, the program assumes you understand its rule.

The rules are many and varied and often quite difficult. A challenging game!

SUBJECT AREAS

Words, Logic

Author: Rick Marks

QUEST

31

This is one of those games that just wasn't possible before computers. You are in search of a treasure hidden in a system of caves by a pirate. Your object is to find the treasure and escape, but the going is rough. You get lost in twisty little mazes, chased by a giant, you slide down chutes, and more. Very exciting.

In order to win, you are finally forced to draw yourself a map. Excellent learning experience.

SUBJECT AREAS
Geometry, Simulations
AUTHOR: Peninsula School
Copyright, 1978

DRAW

32

This program enables you to do very sophisticated drawing on the screen using the full range of PET graphics. To get the most out of the program, read the little blue instruction manual for it put out by the program's authors, Peninsula School.

Here is a partial list of commands:

- 1 -- to lower left
- 2 -- down
- 3 -- to lower right
- 4 -- left
- 6 -- right
- 7 -- to upper left
- 8 -- up
- 9 -- to upper right

Press any key to change the graphics symbol to the new one on the key. To get the graphics symbols on the number keys, you must also hold down the Shift key.

To erase, press Space, which makes the space your new drawing symbol.

Press Rvs to reverse the color of the current drawing symbol.

There are many other features to this program explained in the manual, including saving the picture on tape, using high-resolution graphics, and how to move without drawing. This program is very similar to ETCH, more versatile in some ways, less in others.

SUBJECT AREAS

Graphics

AUTHOR: Peninsula School
Copyright, 1978

PILOT INTERPRETER

33

This is not a program but an interpreter which enables you to write programs in the language PILOT. PILOT was initially designed to be a simple language for CAI, Computer Aided Instruction. It also turns out to be a good first language for children and adults to learn.

To use the interpreter, you will need to read the manual put out by the program's authors, Peninsula School.

The language is best suited to programs that are word rather than number oriented. Some of the commands are:

- T : for Type out a message
- A : for let the user Answer
- M : for Match the answer with the list of expressions after the colon
- JY : Jumps to a new place if a match was made
- JN : Jumps to a new place if a match was not made
- U : Use a subroutine

There are more commands than these and the interested user should consult the manual. To see an example of a program written in PILOT, look at the program SKY.

SUBJECT AREAS

Programming Languages

AUTHOR: Larry Tessler, Peninsula School

Copyright, 1978

GAMMON GAMBLER

34

Here is a very sophisticated program which will play an excellent game of Back Gammon. You can have the PET play at any of 10 levels. It plays quite quickly at any level. The complete rules of Back Gammon are supported including the use of the doubling cube.

For complete instructions in using the program and in the rules of the game, consult the manual for the game. A summary of what to do for the various prompts is given here.

Prompt	Type	Action
Reset?	Y	Sets score to zero-zero and lets you change the skill level.
	N	Sets starting score at last game's score.
Level	0 ... 9	Sets skill level from beginner (0) to expert (9). Score is reset to zero-zero.
Shake	#	Displays point numbers during your turn.
	D	Offers double to PET.
	any key	Rolls the dice.
Die #	#	Displays point numbers during your turn.
	point no.	Moves the stone on that point the same number of points as that die.
	N	Takes back all moves made for the turn.
	X	Reverses the dice display.
	B	Enters a stone from the bar.
	S	Skips a move.
OK?	#	Ends your turn and displays point numbers through the computer's turn and your next turn.
	Y	Ends your turn and erases oint numbers if they were displayed.
	N	Takes back all moves and you can replay the whole throw.
Double	A	Accepts computer's offer of double.
	R	Rejects computer's offer of double and ends game.
Anytime	\$	Displays skill level of current game.

SUBJECT AREAS

Strategy Games, Games of Chance

Author: Personal Software, Copyright, 1979

RACETRACK

35

You can play against another player or simply against time. A track is drawn and you are in control of a car. You can specify the direction of the acceleration at each cycle and try to move around the track in the shortest possible time. If you run into the wall or an obstacle or the other car, you are out for the round.

With some work, you are allowed to alter the track to make it more challenging. The graphics are excellent, the cars even point in the direction of movement.

Working with this game increases one's intuitive feel for velocity and acceleration. Most plays begin by not understanding the difference.

SUBJECT AREAS

Simulations, Video Games, Physics
AUTHOR: Bill Finzer

PAK JANA

36

This is a dance choreography program named after a famous Indonesian dancer whose "likeness" appears on the screen.

The program has no room for instructions so you must use written instructions. The pictures on the next pages show you the different body parts you can substitute. Here is a list of commands:

[n stands for any digit]

HEn changes the head or expression

LAn changes the left arm

RAn changes the right arm

LLn changes the left leg

RLn changes the right leg

WA followed by any number followed by a dash causes the dancer to wait that many tenths of a second.

8 moves dancer up

4 moves dancer left

6 moves dancer right

2 moves dancer down

GBn-m causes computer to re-execute the last n instructions m times. Dashes are important!

E causes the whole dance to be executed without pause

P list the whole Program on the screen

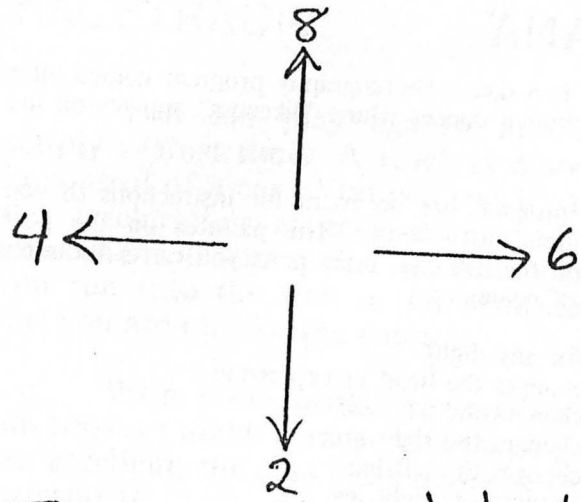
F Finished, start all over

In essence, this program creates a simple animation language. It is also fairly simple to go into the program and change the figure to that of an animal or face or whatever.

SUBJECT AREAS

Programming Languages, Graphics
AUTHOR: Bill Finzer, Copyright 1978

Pak Jana Movements



To move the whole body type one of the above numbers

Head expressions

 7	 8	 9
 4	 5	 6
 1	 2	 3

Type HEn where n is 1-9

Pak Jana Movements cont'

RAn (right arm)

 7	 8	 9
 4	 5	 6
 1	 2	 3

LAn (left arm)

 7	 8	 9
 4	 5	 6
 1	 2	 3

RLn (right leg)

 7	 8	 9
 4	 5	 6
 1	 2	 3

LLn (left leg)

 7	 8	 9
 4	 5	 6
 1	 2	 3

Other commands

- WAn - wait n/10 seconds
- G-Bn-m - Go Back n instructions and repeat m times
- P - list Program
- E - Execute program
- F - Finished, start all over
- D - Delete last step

You are the pilot of a Lunar Landing Module approaching the surface of the moon. You have to vary the thrust so that you will land safely and without running out of fuel.

Everything happens in real time in this program, that is there are no waits for you to make a new decision. You quickly get a very good intuitive feel for the concepts of acceleration and velocity.

The graphics are fun, too.

SUBJECT AREAS

Simulations, , Physics

AUTHOR: Unknown, obtained from LHS

The PET acts as therapist and asks you questions about yourself. Based on your answers, sometimes surprising replies are generated. This is a version of a classic computer program which actually started many therapists thinking about how to computerize their work! After you play for a while, you realize how limited the computer's responses are.

SUBJECT AREAS

Words

AUTHOR: Unknown, obtained from LHS

HEART'S DESIRE

39

A board is drawn on which is located you with your empty heart, the object of your heart's desire, some obstacles, and some robots. As a round begins, the robots start moving towards you. If they hit an obstacle, they are destroyed. If you hit an obstacle or are pounced on by a robot, you are destroyed (for that round). Your object is to avoid all the robots and get to your heart's desire, which also moves around.

This is a version of a very popular computer game called Chase. It's extremely fun to play. After each round the number of obstacles changes as does the number of robots, depending on how you did in that round.

SUBJECT AREAS

Video Games

AUTHOR: Bill Finzer

This program is similar to "DRAW" in that it enables you to create pictures on the PET screen using PET graphics. Since it is useful to have a list of commands on paper while you use this program, here they are.

The number keys are held down to move the brush across the screen:

- 1 - lower left
- 2 - down
- 3 - lower right
- 4 - left
- 5 - picks pen up
- 6 - right
- 7 - upper left
- 8 - up
- 9 - upper right

- B - to change brush stroke
 - W - to change brush width
 - E - to erase and then E again to get same brush
 - C - to change one character to another the whole screen
 - N - number for saving as a program
 - K - for single key mode
 - F - when finished with picture
 - S - to save on tape
 - L - to load picture from tape
- back to
over

SUBJECT AREAS

Graphics

AUTHOR: Bill Finzer

You write a simple program to tell the "turtle" how to move. Then the turtle does it, creating a design as it goes.

The programming language you use consists of the following commands: (n stands for any number and * stands for any graphic or letter symbol)

- Ln - move left n spaces
- Rn - move right n spaces
- Un - move up n spaces
- Dn - move down n spaces
- M - lift the pen, don't leave a trail
- P - put the pen down, leave a trail
- C* - change the drawing character to *
- Sn-m - skip back n instructions and repeat them m times
- E - end the program

If the turtle is about to go off the screen, it reappears at the other side. Using the S instruction to create loops, combined with the "wrap-around" capability of the screen means that simple programs can produce complex and beautiful results.

This program makes an excellent introduction to the concept of programming itself.

SUBJECT AREAS

Programming Languages

AUTHOR: Bill Finzer

SPRING

COMMISSIONER OF THE
SCHOOL DEPARTMENT
STATE OF NEW YORK

ALBANY, N. Y., 1911

FALL

ALBANY, N. Y., 1911

COMMISSIONER OF THE
SCHOOL DEPARTMENT
STATE OF NEW YORK

ALBANY, N. Y., 1911

SPRING

40

This program simulates the situation where an object lies on a frictionless table. Attached to the object is a spring. You are holding the other end of the spring. If the spring is stretched, then the object will move towards you; if it is compressed, it will move away from you. As it moves on the screen, you can have it leave a trace of where it has been. Also, you can move your end of the spring so that while originally the object may have been travelling in a straight line, it starts orbiting around your end of the spring.

You can have the PET set up some reasonable initial conditions or you can experiment with setting up your own.

The patterns that are produced by the trace of the object are often quite beautiful. This is because the object's orbit around your end of the spring precesses due to small inaccuracies introduced by the finite integration process. Reducing the interval of integration lessens this precession.

Although aimed at those who want to know more about how springs behave, this program can be used just to enjoy the delightful patterns that get produced.

SUBJECT AREAS

Simulations, Graphics, Physics

AUTHOR: Bill Finzer

Copyright, 1978

COUNT

41

Designed for use with young children, this program allows the user to choose a beginning and ending number and a number to count by. If the numbers are integers between 1 and 100, they appear very large on the screen. Otherwise they are small. PET can count to very large numbers and by steps both bigger or smaller than one. After 200 counts a chart appears to keep track of the time it is taking to do the counting. Every so often, messages appear from PET to the user about how it is to count numbers.

A good program to give children a better feel for numbers.

SUBJECT AREAS

Numbers

AUTHOR: Bill Finzer

POSTAL

42

You are a postman whose problem is to choose a way through your route without having to duplicate any streets. The routes are graded from easy to hard. So you can start with an easy route and work your way up to the hard ones.

This program teaches some fundamental topological concepts. The graphics are pretty good, though the instructions are a little unclear.

SUBJECT AREAS

Geometry

AUTHOR: Bill Finzer

DICE -

43

This program simulates the process of throwing up to six dice each of which has up to 20 faces any number of times. You can watch the dice being thrown and see the distribution build up on a graph as the dice are thrown. The distribution is of the sums of the faces. At the end the PET shows a table of frequencies as well as the graph.

This program is meant to supplement work in the classroom with dice and probability. Good for getting some intuitive feel for normal distributions and how far from normal the actual distribution can get, depending on the number of trials.

SUBJECT AREAS

Probability, Simulations

AUTHOR: Bill Finzer

METEOR

44

The screen is filled with stars and suddenly a meteor streaks across. Your job is to press a key as soon as you see it. The PET then tells you your reaction time to the nearest tenth of a second and fills up the screen with more stars. More if your reaction time was good and fewer if it was slow.

At the end, when you choose to stop, a graph is drawn showing how your reaction time depended on how many stars were on the screen.

SUBJECT AREAS

Simulations

AUTHOR: Bill Finzer

MANDALA

45

By giving the PET a few numbers, some incredible designs get drawn for you. Then you can overlay these designs to create almost infinite variety. The designs are based on a sine curve of horizontal distance, vertical distance, distance from the center, or angle around the center.

At each point on the screen, the PET computes a number based on what kind of design you asked for, the frequency, phase and amplitude you gave it, and then chooses a graphics point. Because part of the program is in machine language, the whole thing happens very quickly, so you get to play around with the parameters. This makes for a rich ground for experimentation.

By starting the program with RUN 2000 instead of the usual RUN, the PET will randomly determine the designs itself. Sometimes you can get some interesting ideas from these computer designs.

SUBJECT AREAS

Graphics

AUTHOR: Bill Finzer

BROWNIAN

46

This is an interesting simulation of the situation where one molecule is bouncing around in a box (with other molecules which you don't see). Every time the molecule hits another molecule or the side of the box, it changes direction. The new direction is totally random.

You have control over how far the molecule will go on the average before it hits another. You can also have the molecule leave a trail behind it or not. The patterns made when a trail is left behind are quite interesting and vary enormously depending on the average distance between collisions.

To stop the molecule, you have to press the STOP key. To start again, you must type RUN and hit return.

SUBJECT AREAS

Simulations, Physics

AUTHOR: Bill Finzer

BLACKJACK

47

This is a nice version of the traditional card game in which one person can play against the computer as dealer. You can place your bet before the cards are dealt and the PET keeps score. The cards are nicely drawn.

You and the dealer are dealt one card face down and a second card face up. You can see both your cards. Numbered cards count their number, face cards count ten, and aces can count either ten or eleven. Your object is to get as close to 21 as possible without going over. If you want another card, you say HIT, otherwise you STAY. The dealer then takes cards in the same way. The dealer wins unless your score is better than his.

SUBJECT AREAS

Games of Chance

AUTHOR: Unknown, obtained from LHS

YAHTZEE

48

Directions for this game of chance are not included with the program for lack of space.

One or two human players can play, with or without the PET as player. For each player's turn, you get three rolls of five dice. You are trying to get each of the "hands" listed in the table at the top. For example, a House is a full house of three of one kind and two of another. In each roll in a turn after the first one, you get to keep whichever dice you want. You specify this by typing the numbers on the faces you want to keep.

After the third roll, the computer says SCORE AS. You pick the hand you want and type the first character (highlighted in the table) to signify that is the one you want. You may not pick a hand which has already been scored.

The hands on the left are for as many of a certain number as possible. For example 3's are scored by adding up as many 3's as there are in the hand. If you get 63 or more points total here, you get a bonus of 35 points. 63 points is what you would get if you got three of each number.

On the right, Three and Four are scored by adding all the dice, if you got three or four of a kind. Small and Large stand for four or five numbers in a row. Yahtzee stands for five of a kind. And Chance is the sum of all the dice.

This program has good graphics and the PET plays a good game, computing probabilities as it goes.

SUBJECT AREAS

Games of Chance, Probability
AUTHOR: Bill Finzer, Copyright, 1979

KALAH

49

You play the computer in a version of this ancient game. The computer will play at any of four levels from random play to a level where it looks ahead three half-moves (at which it is very difficult to beat).

The program doesn't have directions on it so you need a separate sheet. Basically, a move consists of picking up all the stones in one of your six pits and sowing them one at a time counter-clockwise around the board.

If you manage to go completely around and land in one of your own pits, you must go again with the stones in that pit.

If you land on your opponent's side and there are exactly 2 or 3 stones in that pit (after you land) then you capture those stones and put them in your kalah. If the stones in a pit have been captured, the stones in a preceding pit are also captured if there are again exactly two or three.

The object of the game is to get as many stones in your kalah as possible. If a player cannot move, the game is over and all the stones left go into the opponent's kalah.

The graphics are good and you can watch the computer thinking. Also, you can have the computer print out the decision tree it is using to decide on its move.

SUBJECT AREAS

Games of Chance, Probability
AUTHOR: Bill Finzer, Copyright, 1979

PLANET

50

You are commanding a space probe about to fly by a planet. By firing your thrusters in any of eight directions, you try to bring the probe into orbit around the planet. Then you try to bring the orbit close enough for a good picture. Finally, you leave orbit for the return voyage.

This is a wonderfully realistic simulation of the space probe situation. The user gets a real feel for orbital mechanics. Also, if you get good, you get a chance to alter the gravity and thus see the effects of greater or less gravity.

The instructions and graphics are excellent.

SUBJECT AREAS

Simulations, Physics

AUTHOR: Dennis Sullivan, LHS

HAMURABI

51

In this simulation, you are the king of a small country. Each year you have to decide how much land to buy or sell, how much food to distribute to your countrymen, and how many acres to plant. On the basis of your decisions, the PET then tells you how many people came into your country, how many people died of harvest, and what were the results of some random catastrophes such as the plague or rats eating the grain.

There is no specific goal set by the program; you set your own. It is difficult to get a very large population of people without figuring out by experimentation how much food is needed per person and how much land they can plant.

This is a good introduction to the world of simulation.

SUBJECT AREAS

Simulations

AUTHOR: Peninsula School, Copyright, 1978

UNDERWATER

52

Here is an exciting video game in which you try to rescue swimmers from sharks, managing to avoid obstacles at the same time. The swimmers are swimming to the beach and the sharks are going after them. If you can reach a swimmer, he/she will be saved. If you get eaten by a shark, the round is over.

Excellent instructions and graphics.

SUBJECT AREAS

Video Games, Simulations, Strategy Games

Author: ?

LEMONADE

53

You are given \$10 and a chance to purchase the needed supplies for opening a lemonade stand. Each day you can purchase more supplies if you wish. You are told the temperature and relative humidity (the hotter and more humid it is, the more lemonade people will buy) and you set the price of a cup. Then you see how much lemonade you sell. If you set your price too high, you won't sell much. If you set it too low, you won't make as much as you could have.

After the day is over, you are told how much you made and how much you could have made if you had done as well as theoretically possible.

This is a very pleasing and easy program to use. There is a nice picture of the stand, records appear in tabular form, and you get to watch your supplies diminishing and cash on hand mounting as the lemonade is sold. A great simulation!

SUBJECT AREAS

Video Games, Simulations, Strategy Games

Author: Peninsula School

Copyright, 1978

SKY

54

SKY asks questions such as "What do you see in the sky?" and "What do trees have?" How you answer these questions usually determines what happens next. The program is suitable for those 8 and older; typing assistance may be required for younger children. This program demonstrates how to use PILOT's Y and N statement conditions in various ways.

SUBJECT AREAS

Words

AUTHOR: Peninsula School, Copyright, 1978

ZONE X

55

This is a game for one person where the computer has drawn two lines on a 15x15 grid. The lines intersect each other somewhere on the grid. Your task is to find the point of intersection.

To do this, you make guesses, giving the number over followed by the number up. The two lines divide the grid into four regions which PET has labelled with four different colors (or graphic symbols). These clues help you to figure out where the crossing point must be.

This is fairly advanced graphics game which can equally well be played by two people with paper and pencil. For the precede by Hurtle and Snark.

SUBJECT AREAS

Strategy Games, Geometry

AUTHOR: Bill Finzer, Copyright, 1978

THEORY

56

This program is based on a movie by Larry Lowery of <UC> Berkeley called "Motion in a Fictious Universe." Different shaped balls come in from different sections of the screen and appear to bounce off each other. At first, this bouncing off appears normal, but soon the user discovers that some things are very unusual about it.

The program leads you to discover the laws of this universe by asking you to predict what you think is going to happen. It is an excellent example of a program which leads you to build a model.

The particular rules for the universe are easily modifiable by changing a few parameters in the program. A possible extension of the program would be to give the user control over the difficulty of these rules, having the PET choose from a set of them.

SUBJECT AREAS

Simulations, Physics

AUTHOR: Dennis Sullivan, Copyright, 1978

NUMBER-TOE

57

This is a game for two players similar to tic-tac-toe. Instead of placing X's and O's, you are placing any of the digits 0 through 9. Your object is to form three in-a-row such that they can be read as a true equation. For example, if 2, 3, and 5 were in a row you would win with $2+3=5$. You may not use any digit more than once.

This results in a strategy game that is interesting to analyse.

The computer serves to keep track of players' moves and to check for a win. The graphics and instructions are excellent.

SUBJECT AREAS

Strategy Games, Numbers

AUTHOR: Jose Gutierrez

Two cards are dealt onto the table, face up. You may bet from zero to one hundred dollars on whether the next card will lie between the two showing. Aces are counted high and if the third card is equal to one of the showing cards, you lose.

The Pet will play along with you, making its bets after you do. You can set its strategy to be one of four, from random play to what it claims is optimal. In this way, you can compare your strategy with various computer strategies.

For each hand, odds are given depending on the cards showing. If the odds are three to one, that means that if you bet ten dollars and win, you will be repaid thirty dollars. If you lose, you just lose your ten dollars.

The graphics and instructions for this program are outstanding.

SUBJECT AREAS

Games of Chance, Probability

Author: Vince Mills

If you really love numbers, you will like playing with this program. It allows you to find the factors of any number, begin a search for primes starting with any number, and to print out a pattern of primes as a rectangle, spiral, or triangle.

The patterns that you will see are truly surprising, making one believe that there actually are predictable patterns to the primes.

The program will handle primes up to eight or nine digits long and is not too slow in finding them.

SUBJECT AREAS

Numbers

AUTHOR: Bill Finzer

ANIMALS

60

This is a delightful game in which you think of an animal and the PET tries to figure out what it is by asking you Yes-No questions. If the PET reaches the end of the animals it knows, it asks you what animal you were thinking of and what question would distinguish that animal from the last one it knew. This new animal and question are remembered for the next turn. In this way a library of animals is built up.

SUBJECT AREAS

Words

AUTHOR: Arthur Luehrmann, LHS
PET version by Bill Finzer

SPIDER

61

This is a programming language for creating some wonderful graphics designs. The basic commands are few and simple. Turn left or right a certain number of degrees and move forward a certain number of steps. The unique feature of this program is that you can define new procedures built from these primitive ones so that everytime you type CIRCLE, for example, you get a circle. This idea is taken from work by Seymour Papert at MIT.

Here are the available commands (n stands for a number):

- Ln turn Left n degrees
- Rn turn Right n degrees
- Fn move Forward n steps
- P define a new Procedure
- Q End of procedure definition
- T leave a Trail
- M Move without a trail
- Gprocn Go do the named procedure n times;
e.g. GCIRCLE5
- E Execute the whole program
- H Help! List these commands
- D Delete the last instruction
- I list the Instructions you have
programmed so far
- S Start all over

It is also possible to do simple editing of your program. This is overall a surprisingly versatile graphics program.

SUBJECT AREAS

Programming Languages, Graphics
AUTHOR: Bill Finzer, Copyright, 1978

DESIGN

62

This computer graphics program allows you to cover the screen with your choice of characters and then will gradually alter the screen by either moving the whole pattern in towards the center on a spiral path or moving it toward the bottom of the screen on a spiral path or moving it toward the bottom of the screen on a zig-zag path. The size of the spiral and/or zig-zag are varied by the user.

Sometimes startling patterns arise from the transformations. Best results seem to come from fairly simple patterns which alternate black and white. Also, choosing an initial pattern whose length is relatively prime to the size of the spiral or zig-zag seems to help.

SUBJECT AREAS

Graphics

AUTHOR: Bill Finzer

NIM

63

The PET makes several piles of sticks (from 3 to 8, you choose how many). You take turns removing sticks. You can remove as many sticks from a single pile as you please. Whoever takes the last stick wins.

You get to choose how well the PET plays. At its best, it is playing a perfect game. Otherwise it sometimes makes random moves. The worse you ask it to play, the more frequently it makes random moves. If you win, the next game will be played with a lower frequency of random moves. If you lose, PET will play worse, by making more random moves.

This is an old classic game ideally suited to the computer since there is a complete solution. This solution is difficult to come by though, so it makes a challenging game.

The graphics and instructions to this program are quite good.

SUBJECT AREAS

Strategy Games

AUTHOR: Bill Finzer

3- D PLOT

64

This program graphs functions of X and Y with lines of constant Y so that they appear to be three-dimensional. You are offered a choice of any of five functions or your own function. The five examples use sine, cosine, and exponential. You can write your own as any polynomial or any BASIC function like natural log, arctan, any root, etc. The given examples are quite interesting. It takes quite a bit of fooling around to find functions that produce pleasing results. In the process, you learn a lot about the function itself.

The graphics are done in PET high-resolution, which only does marginally well. You must scale your function so that the part you are interested in will be contained as x and y both scan from -1 to +1. The value of the function itself should also be approximately limited to between -1 and +1.

This program can be a lot of fun for someone with some algebra and familiarity with different functions.

SUBJECT AREAS

Graphics, Numbers, Algebra
AUTHOR: Bill Finzer

PLOT

65

This program will plot functions of X and Y. It will plot up to five functions on the same pair of axes (but this is already very confusing). You can also plot a set of data points if you wish. You must tell PET what limits on the X and Y axes to use. It then draws the axes, labels them (having chosen nice round numbers) and plots the curves.

You can learn quite a bit about different functions with this program. Sometimes just choosing appropriate limits teaches you about the function. It's nice to be able to have the curves come out quickly without much fuss.

SUBJECT AREAS

Graphics, Numbers, Algebra
AUTHOR: Bill Finzer

TRAP

66

The computer thinks of a number between 1 and 100. You try to guess it. Each guess consists of two numbers and the computer tells you whether its number is between them (including the end numbers). You get 5 guesses.

At first this seems like ordinary Guess My Number. Watch out! It isn't.

SUBJECT AREAS

Strategy Games, Numbers

AUTHOR: Unknown

GAME X

67

Framed as a puzzle in which you try to move pieces as quickly as possible from one end of the board to the other, this program is meant to simulate the situation of a scientist searching to discover the rules by which things work. Every time you make a move, the computer moves the piece again. You must discover the computer's rules in order to solve the puzzle.

The graphics and method for moving pieces around are very nice, though perhaps confusing. There are two levels of puzzles.

SUBJECT AREAS

Simulations, Strategy Games

AUTHOR: Design by Ted Kahn,
Pet version by Bill Finzer,
Copyright, 1979

STARS

68

You guess the computer's number. The closer you are, the more stars you get! Can you discover the rules by which the computer gives out stars. If you can, you will be able to find the number faster.

Once you have begun to search for strategies in games, you will want more and more games to practice on. This is a good one.

SUBJECT AREAS

Strategy Games, Numbers

AUTHOR: Unknown

MUGWUMP

69

Get out your graph paper and compass! There are four mugwumps hiding on a two-dimensional grid. Each time you input a point you are told how far it is from each of the mugwumps. Your goal is to find all the mugwumps.

This is a good strategy game and can also be used to give practice with the process of triangulation. Two people can play with each other just as well without the computer.

SUBJECT AREAS

Strategy Games, Geometry

AUTHOR: Unknown

WESTWARD HO!

70

You are on a journey with a wagon train. You make decisions about what supplies to buy, whether to hunt for food, whether to race an Indian Chief, etc. You also shoot deer, and perhaps have a gun battle with a cowboy. Whether you die or make it depends on not running out of food and supplies.

This is a very nice simulation with lots of fun graphics and exciting action.

SUBJECT AREAS

Simulations, Games of Chance

AUTHOR: Unknown

ESCAPE

71

You are trying to get through a maze. But there are robots patrolling and you musn't get caught. So your timing in moving through the opening and closing doors has to be just right or they will get you.

This is a pleasurable video game involving some coordination and planning in real time.

The directions are a little confusing. You are moving to the right. You can only move when the door to your right is open.

There are different levels of strategy for the robots.

SUBJECT AREAS

Video Games

AUTHOR: Brad Compton, Copyright 1978

QUBIC

72

This is Tic-Tac-Toe in three dimensions. There are four 4x4 boards and your object is to get four in a row in any direction. If you are not very familiar with this game, you will need a real board to help you. This game is marketed commercially by many game companies. Four markers are in a row if a string, pulled taut, connecting their centers would be straight.

There are no directions. The program just starts by asking if it may go first. Then it draws the four boards laid side by side. Input your move by specifying which board and numbered position on that board, separated by a comma.

This program plays very well and very fast (23 seconds or less per move).

SUBJECT AREAS

Strategy Games, Geometry

AUTHOR: Joseph Roehrig

timing improved by Mike Louder

TOWER OF HANOI

73

This is an ancient puzzle in which there are three posts. On one of the posts is a series of disks with the largest on the bottom, getting progressively smaller toward the top. You may move only one disk at a time and you may never put a larger disk on a smaller one. The object is to transfer the entire pile to another post.

The graphics and ease of manipulation on this program almost make me believe it can be worthwhile to use the computer for representing the real puzzle. Still, I prefer the feel of wood to the computer keyboard.

SUBJECT AREAS

Simulations, Strategy Games

AUTHOR: Tod Moore, Copyright 1978

STORY PROBLEMS

74

The PET asks you some questions about your life and interests and uses your answers to construct several different kinds of simple story problems. The problem solutions involve simple addition, subtraction, and multiplication.

This is a delightful program for kids needing to practice such problems.

SUBJECT AREAS

Numbers, Drill and Practice

AUTHOR: Pet Cassette Exchange,
Madison Wisconsin

SPACE SHOOTER

75

In the movie "Star Wars" we watch Darth Vader trying to shoot down Luke Skywalker's fighter. He lines up the fighter between the crosshairs on a computer screen. That is the situation represented by this program.

You move the enemy ship by pressing the number keys in the usual fashion. 2 moves the ship down, 4 moves it left, 6 moves it right and 8 moves it up. When you think you have the ship between the crosshairs, you quickly press the F key to Fire at it.

The enemy ship is fortunately not firing at you while this is going on. But, there is a 60 second time limit, after which you are killed. There are several levels of play.

This is a nice game with excellent graphics.

SUBJECT AREAS

Video Games, Simulations

AUTHOR: Dave Howe

BATTLESHIP

76

For the person who loves the game of battleship but can never find anyone to play with, here is the answer. PET will patiently play away, both hiding ships and trying to guess where yours are.

The graphics and interface are excellent.

SUBJECT AREAS

Simulations, Strategy Games, Games of Chance

AUTHOR: Jim Butterfield

BUGGY

77

The computer becomes unable to do simple arithmetic! You have to figure out what error it is making. There are 7 different "bugs" the computer might have. You chose one by number and then Buggy shows you a problem it does wrong. By looking at the problem, you make an hypothesis about what it might be doing wrong.

The next step is to test your hypothesis by giving Buggy pairs of numbers and seeing how it treats them. Does it make the mistake you thought it would?

When you think you understand the bug, you press B. You then are asked to explain what you think is wrong in English. Now Buggy gives you problems to do. You must answer each problem as you think Buggy would. If you get three of these problems correct, then you have solved the bug.

Score is kept too. You start with 100 points. For each problem you pose Buggy, 5 points are subtracted. If you get to the stage where Buggy poses you problems and you miss, then 10 points per problem are subtracted. Then you go back to posing it problems. Try to solve the bug in as few trials as possible.

SUBJECT AREAS

Simulations, Strategy Games, Games of Chance

AUTHOR: Jim Butterfield

Suppose you are raising chickens. Having a scientific bent, you do some experimenting with different diets to feed your chickens. Some chickens you raise on a corn diet and others you feed wheat. One day someone suggests to you that perhaps your chickens could use some copper in their food--that they don't get enough naturally.

So you try 150 grams of copper in half the chicks' diets. And you notice considerable improvement in their growth rate. That is, they are heavier chickens after two months of growth.

"Aha!" you say. Now is the time for a real experiment. You correctly guess that there is some best level of copper to feed the chicks. (Too much would kill them.) So you undertake several years worth of experiments to answer the following five questions:

1. What is the best amount of copper to add with the corn diet?
2. What is the best amount of copper to add with the wheat diet?
3. Using the best amount of copper with the corn diet, how much improvement is there compared to using no copper?
4. Using the best amount of copper with the wheat diet, how much improvement is there compared to using no copper?
5. Which diet benefits most from the proper addition of copper: wheat or corn?

In your chicken house there are four brooders. Each brooder has eight separate cages which can hold and feed 16 chicks each. Now the trouble is that there are two other main things which you know from past experience will influence the growth of a chick. The first is the particular brooder they are housed in. Different brooders seem to do quite a bit better than others, presumably due to their position in the chicken house. The second is that different tiers within a brooder will do better than others, presumably due to the amount of heat they get. You have noticed in the past that if the second tier does better in one brooder, it will do better in the other brooders, too, by about the same amount. So, in order to answer the questions you have posed, you will have to control for the effect of the brooders and tiers.

More detailed directions are available. You can see if you found the right answers by typing
@RUN"P.CHICK RESULTS".

SUBJECT AREAS

Simulations, Probability, Statistics

Author: Bill Finzer

Copyright: University of Reading, 1979

Here you are given a chance to be a farmer trying to do an experiment to find out the best combination of variety, heat, and light to grow the most tomatoes. This program is intended to be used in conjunction with class work.

Two farmers, call them Adams and Bloggs, are growing greenhouse tomatoes in New Jersey. After several years, they notice that Bloggs clearly gets higher yields than Adams. Unfortunately, it is not clear why. The reason is that there are several factors which might account for the difference: heating, lighting, and variety of tomato. Farmer Adams is a conservative and uses standard heating and lighting and a variety called Red. Farmer Bloggs has been using supplementary heating and lighting and a new light-colored variety called White.

You are to design a two-stage experiment to determine what is the best combination of variety, heat, and light to get the maximum yield of tomatoes.

These are lean times and research money is tight; thus, you can have only a small greenhouse to perform this experiment. There are six experimental plots facing north and six plots facing south. We know from previous experiments that there is a substantial difference in yields between the two sides of the greenhouse.

The procedure is as follows:

1. Decide which treatments you want to apply to particular plots in the first stage of the experiment.
2. Run the program TOMATO to enter you treatments and receive your yields. Copy these yields on the form provided.
3. Interpret your yields.
4. Design the second stage in the same manner as before and receive your new yields.
5. Interpret your new results.
6. Reach your conclusion about which combination of variety, heat, and light gives the best yield.

After you have done your experiment, you can see if you found the best combination by typing
@RUN"P.TOMATO RESULTS".

SUBJECT AREAS

Simulations, Probability, Statistics

Author: Bill Finzer

Copyright: University of Reading, 1979

WORD LADDER

80

In this game you start with the word MATH and try to get to the word HUMS. In each move you change one letter at a time. For example, you can change MATH to BATH in one move. Also, you will have to stick to words that are in the program's dictionary. It knows about 250 words that can be gotten starting from MATH. HUMS is among them.

If you want to know the words that the computer knows that are possible from wherever you are at the moment, just type H instead of a new word.

After you have completed this first game, you can play other games which are formulated by the program choosing randomly from its list of words.

SUBJECT AREAS
Words
Author: Bill Finzer

CHESS

81

This is MicroChess 2.0 by Peter Jennings, a by now classic chess program. Playing at its best, the computer may llok ahead up to three moves for each side, taking often two minutes to deicde on its move. At this, it plays a surprisingly competent game.

You will need the full set of instructions in the manual to play. Here is a brief summary of some of the commands:

IQ =5 Reset level of play from
 1 to 8
X Exchange the pieces
 from one side to the other
O-O Castle on king's side
O-O-O Castle on queen's side
E2-E4 An example move
R Resign
Stop Pressing the Run/Stop
 key will stop the clock until you
 press N or reset the board if you press Y.

SUBJECT AREAS
Strategy Games
AUTHOR: Personal Software, Copyright 1978

CHECKERS

82

This program will play an excellent game at any of 8 levels (1 is easiest, 8 is hardest).

For complete instructions in using the program and in the rules of the checkers, consult the manual for the program. Here is a brief summary.

You.Type	Action
C (Return)	Clears all pieces from the board.
G0 (Return)	Returns board to its position just prior to your last move.
G(x) (Return)	Retrieves any of three board positions saved during a game, where (x) is the number 1, 2, or 3.
IQ=(x) (Return)	Sets skill level, where (x) is number from 1-8.
M (Return)	Modifies the board by removing and/or adding checker pieces using five modification instructions: Remove: Enter square numbers of any piece or pieces to be removed. White Pieces: Add one or more of your regular pieces to the square numbers entered. White Kings: Add one or more kings to the square numbers entered. Black Pieces: Add one or more of the Checker King's regular pieces to the square numbers entered. Black Kings: Add one or more of the Checker King's kings to the square numbers entered.
N (Return)	Displays the numbers of the board squares as long as you hold it down.
P (Return)	Postpones or forfeits your move by giving move to Checker King.
R (Return)	Resign game. (Recovers if you type G(0) immediately.)
Shift Run/Stop	Pressing these two keys simultaneously interrupts Checker King's "thinking" and resets the board to the beginning of a new game.
S(x) (Return)	Saves up to three board positions during a game. (x) is the number 1, 2, 3. (See G(x) command.)
X (Return)	Exchanges positions with Checker King.
> (Return)	Automatically enters move notation for JUMP: prompt when only one move is possible.

SUBJECT AREAS

Strategy Games

Author: Personal Software, Copyright, 1979

TREK

83

This is one fine version of the classic computer game of StarTrek. The action happens mostly in real time; that is, the Klingons will fire at you even if you aren't moving, and you will keep moving at your present rate of velocity and acceleration until you do something new.

For your first game, you will need to find the full directions in the game manual. None are included in the game itself. Here is a summary of the commands:

digits 1-9 these change your acceleration to be in the direction of that digit relative to the 5 digit.

U - Display long range sensor.

Q - Display short range sensor.

S - Add shield energy.

T - Fire a torpedo.

F - Forward Phasors.

R - Rear Phasors.

Remember that you can dock at a starbase to get refueled.

Don't go off the edge of the universe.

Good luck!

SUBJECT AREAS

Simulations

Author and Publisher: Dad's Reliable Software

Copyright, 1978

COMPARE

84

This program may give elementary school children a chance to play with the relative sizes of different numbers.

Given two numbers, the computer draws a zig-zag line representing the first and then a second zig-zag line representing the second to the same scale.

The numbers can be negative, integers, decimals or fractions.

SUBJECT AREAS

Numbers

AUTHOR: Bill Finzer

SNARK

85

The Snark is hiding on a 10 by 10 grid. Your job is to find her. You can do this by specifying the center point of a circle and then a radius. You will be told whether the Snark is within, on or outside the circle you have drawn. Gradually, you can narrow down the range of possibilities where the Snark might be.

This is an extremely well-done program graphically and the interface is also quite nice.

You will probably need a compass and some grid paper to play because you will want to keep track of your moves. The computer isn't very good at drawing circles!

SUBJECT AREAS

Strategy Games, Geometry

Author: Vince Mills

A BLOCKS

86

You will not succeed with this program unless you have had some experience using the real-object materials, Attribute Blocks.

The computer plays the "Two Loop Game" with attribute blocks where two circles are made on the screen each labelled by a hidden card. Your job is to figure out what the label is on each card. The label may be Red, or Not-Circle, or Large, etc.

You get clues by asking where certain blocks go. For example if you typed in LRC, you would be shown in which loop the Large Red Circle belongs.

If the PET thinks you should be able to figure out either label, it will be quite insistent about asking you to do that.

When you are ready to guess a card, something like CARD 1 IS RED.

You may be able to get some help at certain times by typing either H for Help or P for a list of the Possibilities remaining for each card.

SUBJECT AREAS

Strategy Games, Logic

AUTHOR: Bill Finzer, Copyright 1979

GUESS MY FRACTION

87

This is like the regular game of Guess My Number except that the number you are trying to guess is a fraction.

The limits for the mystery fraction are shown by a number line on the screen. Your guesses also appear labelled on the screen. As your guesses get too crowded, they will appear on an expanded number line.

The strategy for this game differs considerably from that of Guess My Number since the fractions are not uniformly distributed. It is an interesting problem to find the optimum strategy, one that will teach the strategist a lot about fractions.

SUBJECT AREAS

Numbers, Drill and Practice, Strategy Games

AUTHOR: Bill Finzer, Copyright 1979

MATCHES

88

When you ask for the instructions of this game, you will be told how to play the standard version of eleven matches.

In this version you take turns with the computer taking one, two, or three matches from a row of eleven. The player to take the last match loses. You must take at least one match each time.

It's fun to figure out a strategy for playing eleven matches so that you can beat the computer. After that, you can vary some of the conditions of the game to see if you can come up with a completely general strategy.

The things you can change are:

- The number of matches
- The maximum allowed in one move.
- Make person who takes last match the winner.
- Who moves first.

You get a chance to change all these things simply by not asking for directions.

SUBJECT AREAS
Strategy Games, Logic
Author: Vince Mills

BAGELS

89

The computer is thinking of a 3-digit number, no two of whose digits are the same. By making guesses, you are given a clue. The clues have the following meanings:

BAGELS - no number in your guess
is correct

FERMI - one digit in your guess is in
the right place

PICO - one digit is correct but in
the wrong place.

If PICO or FERMI appears twice in one clue it then applies to two numbers.

This is good game for getting learners to think logically. The graphics and instructions are excellent in this versions.

SUBJECT AREAS

Strategy Games, Logic

AUTHOR: Vince Mills, Copyright 1979

OPERATIONS

90

This is a drill and practice program for learning how to apply the rules for order of operations to the evaluation of arithmetic expressions.

There are five levels of problems which start with simple rules regarding parentheses and extend up through roots and exponents.

SUBJECT AREAS

Numbers, Drill and Practice, Algebra
AUTHOR: Vince Mills, Copyright 1979

PET SPSS

91

This program is designed to handle small amounts of data and has the same commands as regular SPSS, though, of course, fewer of them. Here are listed the available commands in an order typical of how you might use them.

HELP This will list all the commands. The *whited* letters are all that you need to type to ask for a particular command.

INPUT MEDIUM Type either K for keyboard or T for tape.

VARIABLE LIST If you are typing in data, you must tell the Pet the names of your variables. For example: age, height.

READ INPUT DATA Allows you to enter the data. If typing, '/' stand for no data. You can also use this to add more data later on.

LIST DATA Lists the data. If there is more than one screenful, pressing S will stop the listing, C will cause the rest to be listed without anymore stops, Return will show next screenful.

EDIT Use this to change an item in your data.

WRITE Make a copy on magnetic tape. Doing this right after you have got your data in will save a lot of headaches.

FREQUENCIES This command will ask you for a variable and then tell you some simple statistics about it and draw a histogram.

COMPUTE Often you will want to make a new variable equal to the sum or difference of other variables. You can type expressions like

$$\text{new} = \text{grade1} + 2 * \text{grade2}$$

Not all expressions are legal, though.

NEW VARIABLE Allows you to add a variable. You will have to type in values for each case.

DELETE VARIABLE Allows you to delete one variable. Especially useful when you run out of space.

CLEAR Be careful of this one! It will erase all your data.

END Stops the program.

SUBJECT AREAS

Statistics

Author: Bill Finzer

GUESS MY MEAN

92

The PET internally generates a normal distribution of numbers with a mean which is unknown to you. Your job is to make estimates about what that mean is.

Numbers come to you one at a time. Twenty numbers will appear all together. After each number, you build a trap for what you think is the mean by specifying two numbers, one a lower limit and the other an upper limit for the mean.

After all twenty numbers have come out the PET scores you by taking off 100 points for each time you totally missed the mean and a number of points corresponding to the width of your trap when you did trap the mean.

Finally, the PET will show you the traps that it built so you can see what a good strategy would be like.

One or two persons can play, or you can just watch the PET play.

SUBJECT AREAS

Numbers, Probability, Statistics

AUTHOR: Bill Finzer, Copyright 1979

BART

93

One of the ways to use computers is to help make complex decisions by bringing both a database of information and computational power within easy reach. This program is a tiny example of what is possible with larger computers. It assumes you would like to decide whether to drive to SFSU from your home or take the BART.

You are asked a series of questions about where you live relative to the BART stations and what combination of transportation you would use and are eventually told the relative cost and times of taking BART as opposed to driving. You can ask for Help for most of the questions and are then given some hints about what reasonable responses might be.

SUBJECT AREAS

Simulations

Author: Bill Finzer

HELP!

94

This fanciful program features an In-Out Machine whose gears are getting worn out and therefore cannot easily do the computation required of him anymore. Your job is to help him out by evaluating algebraic expressions with given inputs.

If you cannot do the evaluation correctly, you bring the poor machine into action and see the terrible pain it costs him to do arithmetic. If you can get enough right, you are given a letter to plug in instead of a number. Finally, you "win enough stars" for the machine to take a well-earned vacation in Bermuda.

This is a good algebra practice program, something there are very few examples of.

SUBJECT AREAS

Numbers, Drill & Practice, Algebra
Author: Diane Resek

COMPUTER POETRY

95

With ideas taken from Wishes, Lies, and Dreams, by Kenneth Koch, this program quickly gets you involved in writing poetry. There are many wonderful side branches through the program depending on how you feel about poetry and what kinds of poems you choose to write.

SUBJECT AREAS

Words
Author: Lori Hansen

PICTURES

96

This drawing program has a stock of small pictures that you can put in various places on the screen to build a bigger picture. You use the cursor controls to move the cursor (the flashing square) around until you get to the place you want to drop a picture. The various possibilities are shown in the upper left hand corner of the screen and pushing the first letter of the picture you want will cause it to appear centered around the cursor. You can also erase the picture by positioning the cursor near the center of one of the pictures and pressing the asterisk key.

It is also possible to add to the repertoire of the program. In order to do this, instead of starting the program with RUN, type RUN 7000. You will give your new picture a name and then draw it using the cursor controls and graphics characters (unshifted keys will produce graphics, shifted keys will produce the letters). When you are done, press return, and your picture will be stored as part of the data of the program. If you save the program, you will be able to show others your additions.

SUBJECT AREAS
Graphics
Author: Bill Finzer

JARGON

97

The point of this program is that the computer business is full of jargon words. You get to ask the computer questions and it will answer with sentences that are mostly nonsense and filled with jargon. If you ask a 'What is?' question, however, and the computer has the word you are asking about stored, it will answer with a reasonable definition.

The main difficulty with this program is that people tend to be taken in, they think the computer actually knows something. It doesn't! You can get some interesting *sounding* answers with questions that include 'where' and 'why', etc.

SUBJECT AREAS
Words
Author: Bill Finzer

Two Saturdays of Computer Fun in Menlo Park

Nov. 8 Come and Enjoy Computers in the Park — 11 am to 2 pm at Fremont Park (rain cancels).

Nov. 15 Family Day at the Menlo Park Public Library — 3 pm to 5 pm

Bring the whole family for an afternoon of exciting activities on the library microcomputers.

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SUBJECT AREAS
Graphics
Author: Bill Frazier

SUBJECT AREAS
Words
Author: Bill Frazier

