Another new game from Creative Computing



987654321

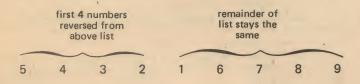


123456789

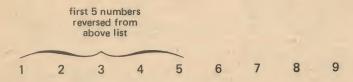
Description

In the computer game REVERSE the player must arrange a list of numbers in numerical order from left to right. To move, you tell the computer how many numbers in the list (counting from the left) to reverse. For example, if the current list is:

and you reverse four numbers, the result will be:



Now if you reverse five numbers, you win!



Playing Strategies

There are many ways to play the game; generally an approach can either be classified as algorithmic or heuristic. The game thus affords the player an opportunity to explore these concepts in a practical rather than a theoretical context.

An algorithmic approach is one that is described by means of a finite algorithm and guarantees a solution in a predictable number of moves. For example, an algorithmic approach to playing REVERSE would be to order the list from right to left starting with the highest value number and moving down. Using this strategy with a list of nine numbers, your first move would always be to get the 9 into position 1 (leftmost) and the second move would be to

reverse nine so the 9 was put into position 9 (rightmost). You would continue moving the 8 to position 1 and then to position 8, the 7, 6, 5 and so on until the list was ordered. This method guarantees a solution in 2N-3 moves (N numbers in the list). One could easily program a computer to play this strategy.

A heuristic approach to solving a problem can be thought of as a rule of thumb. Some rules of thumb are very good and lead to good solutions, others are not as good. Consequently, using a heuristic approach doesn't guarantee the best possible solution but for very complex problems (and even some simple ones) it may be a more efficient approach than a rigorous linear programming or mathematical method which guarantees a perfect solution.

The science of heuristic problem solving using the computer has become very advanced and is widely used for things like locating warehouses, railroad car routing and other problems involving hundreds of variables and many alternative solutions. Consider: a linear programming solution to routing a mixed load boxcar from Boston to receiving points in Hartford, Columbus, Atlanta, and Baton Rouge would take about 0.72 hours to run on a computer. The heuristic solution takes 0.002 seconds to run, yet it generally yields a solution within 5% of the linear programming (perfect) solution. Obviously, with millions of cars to be routed every day, the linear approach is not economically feasible.

The game of REVERSE lends itself very well to a heuristic approach. There are many possible solutions to each game. One is best, but the mathematics to determine this solution are quite complex and would be extremely time-consuming to calculate. (The simpler algorithmic approach above guarantees a solution, but it is far from optimal). A good heuristic approach which takes advantage of "partial orderings" in the list generally yields a solution within 1 or 2 moves of the perfect solution, i.e., within 10%

to 20% of perfection.

Using a heuristic approach, your next move is dependent upon the way the list currently appears. No solution is guaranteed in a predictable number of moves, but if you are clever (and lucky?) you should come out ahead of the simple algorithmic approaches. For a list with nine numbers can you describe a heuristic strategy that wins the game in an average of 10 or fewer moves? You may well use more than one rule of thumb (heuristic).

PROGRAM LISTING PRINT\PRINT "REVERSE -- A GAME OF SKILL"\PRINT RANDOMIZE

130 DIM A(20) 140 REM *** N=NUMBER OF NUMBERS 150 N=9 160 INPUT "DO YOU WANT THE RULES (YES OR NO)"; A\$
180 IF A\$="NO" THEN 210 180 IF H\$="NO" | HEN 210 190 GOSUB 710 200 REM *** MAKE A RANDOM LIST A(1) TO A(N) 210 A(1)=|NT((N-1)*RND)+2 220 FOR K=2 TO N 230 A(K)=|NT(N*RND)+1 210 R(1)=INT((N-1)*RND)+2
220 FOR K=2 TO N
230 R(K)=INT(N*RND)+1
240 FOR J=1 TO K-1
250 IF R(K)=RJ) THEN 230
260 NEXT J\NEXT K
260 NEXT J\NEXT WERE NE GO ... THE LIST IS:"
310 T=0
320 GOSUB 610
330 INPUT "HOW MANY SHALL I REVERSE",R
350 IF R=0 THEN 320
360 IF R(=N THEN 320
360 IF R(=N THEN 320
370 PRINT "OOPS! TOO MANY - I CAN REVERSE AT MOST*N\GOTO 330
390 T=T+1
400 REM *** REVERSE R NUMBERS AND PRINT NEW LIST
410 FOR K=1 TO INT(R/2)
420 Z=R(K)
430 R(K)=R(R-K+1)=2
440 GOSUB 610
470 REM *** CHECK FOR A WIN
480 IF R(K)\G\K THEN 330
590 NEXT K
510 PRINT "YOU WON IT IN"T"MOVES !!!"\PRINT
590 NEXT K
510 PRINT "YOU WON IT IN"T"MOVES !!!"\PRINT
590 NEXT K
510 PRINT\PRINT "O. K. HOPE YOU HAD FUN!!"\GOTO 999
600 PRINT\PRINT "O. K. HOPE YOU HAD FUN!!"\GOTO 999
610 PRINT\PRINT "O. K. HOPE YOU HAD FUN!!"\GOTO 999
610 PRINT\PRINT "O. K. HOPE YOU HAD FUN!!"\GOTO 999
610 PRINT\PRINT "O. K. HOPE YOU HAD FUN!!"\GOTO 999
611 PRINT\PRINT "O. K. HOPE YOU HAD FUN!!"\GOTO 999
612 PRINT\PRINT "O. K. HOPE YOU HAD FUN!!"\GOTO 999
613 PRINT\PRINT "THIS IS THE GAME OF "REVERSE'. TO WIN, ALL YOU HAVE"
614 PRINT\PRINT "THIS IS THE GAME OF "REVERSE'. TO WIN, ALL YOU HAVE"
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618 PRINT\PRINT "THIS IS THE GAME OF "REVERSE'. TO WIN, ALL YOU HAVE"
619 PRINT\PRINT "THIS IS THE GAME OF "REVERSE'. TO WIN, ALL YOU HAVE"
610 PRINT\PRINT "THIS IS THE GAME OF "REVERSE'. TO WIN, ALL YOU HAVE"
610 PRINT\PRINT "THIS ORDER FROM LEFT TO RIGHT. TO MOVE, YOU"
610 PRINT\PRINT "THIS "THIS THE CURRENT LIST IS:"
610 PRINT\PRINT "THIS "THIS THE CURRENT LIST IS:"
610 PRINT\PRINT "NO WORT CAL ORDER FROM LEFT TO RIGHT. TO MOVE, YOU"
610 PRINT\PRINT "NO DOUBT YOU WILL LIKE THIS GAME OF SKILL, BUT"
610 PRINT\PRINT "NO DOUBT YOU WILL LIKE THIS GAME OF SKILL,

SAMPLE RUN

REVERSE -- A GAME OF SKILL DO YOU WANT THE RULES (YES OR NO)? YES

THIS IS THE GAME OF 'REVERSE'. TO WIN, ALL YOU HAVE TO DO IS ARRANGE A LIST OF NUMBERS (1 THROUGH 9) IN NUMERICAL ORDER FROM LEFT TO RIGHT. TO MOVE, YOU TELL HE HOW MANY NUMBERS (COUNTING FROM THE LEFT) TO REVERSE. FOR EXAMPLE, IF THE CURRENT LIST IS:

AND YOU REVERSE 4, THE RESULT WILL BE

5 4 3 2 1 6 7 8 9

NOW, IF YOU REVERSE 5, YOU WIN!

123456789

NO DOUBT YOU WILL LIKE THIS GAME OF SKILL, BUT IF YOU WANT TO QUIT, REVERSE 0 (ZERO).

HERE WE GO ... THE LIST IS:

9 8 6 1 7 3 2 4 5

HOW MANY SHALL I REVERSE? 9

5 4 2 3 7 1 6 8 9

HOW MANY SHALL I REVERSE? 4

3 2 4 5 7 1 6 8 9

HOW MANY SHALL I REVERSE? 2

2 3 4 5 7 1 6 8 9

HOW MANY SHALL I REVERSE? 6

1 7 5 4 3 2 6 8 9

HOW MANY SHALL I REVERSE? 2

7 1 5 4 3 2 6 8 9 HOW MANY SHALL I REVERSE? 6

2 3 4 5 1 7 6 8 9

Another new game from Creative Computing

SCHMU

by Frederick H. Bell University of Pittsburgh Computers, Coordinates, and Schmoos

This Module is a computer-based educational (and fun) game with instructions for its use. It is written in elementary BASIC and is compatible with nearly all BASIC interpreters.

Getting Ready

Before teaching this lesson load SPLAT2 into your computer system, debug it, and save it for future access.

Things to Know

You need to know a little bit about grids and angles. Like, (2,-3) means right 2 and down 3, and 237° is in the fourth (Whoops! That's third.) quadrant. Also, you should remember that the distance something travels through the air depends upon the angle at which it is thrown.

Review the Basics

Can you answer these questions? If not, hit the math books!

1. In each of the four quadrants, what are the signs of the

x- and y- coordinates?

2. If 0° is the angle coinciding with the positive x- axis, what are the measures of angles whose terminal sides fail in Quadrant I? Quadrant II? Quadrant III, Quadrant IV?

Lines 5 to 70 explain how to play SPLAT2. This is a fun game to play in groups of two or three. If you're pretty good you can "splat the schmoo" in about eight tries; but don't cheat and use the formula. And don't expect me to tell you where it's hidden in the program!

More Things to Do

You might want to make a three dimensional game, SPLAT3 - with flying schmoos. The program shouldn't be too hard and it would be a really neat game. If you want to try something easier, fix SPLAT2 so that it requires initial velocities as well as angles. You could even make a low gravity, moon version of SPLAT2.

> **Program Listing** Sample Output



REMarks About BASIC REMark Statements

REMember to REMind yourself when writing BASIC REMark statements to REMain imaginative. If you are not REMiss in this, you can REModel your programs into REMarkable masterpieces with no REMainder of your REMote past before you applied this REMedy and REMoved those old, dull REMark statements. REMit to this REMedial advice and you'll have no REMorse. Before long, you can be REMiniscent about your old programs REMinants of ordinary REMark containing statements.

10 REMARKABLE REMARKS BY DHA