

Crossword Puzzle Pattern Generator

**Robert E. Kennedy
and
Curtis N. Cooper**

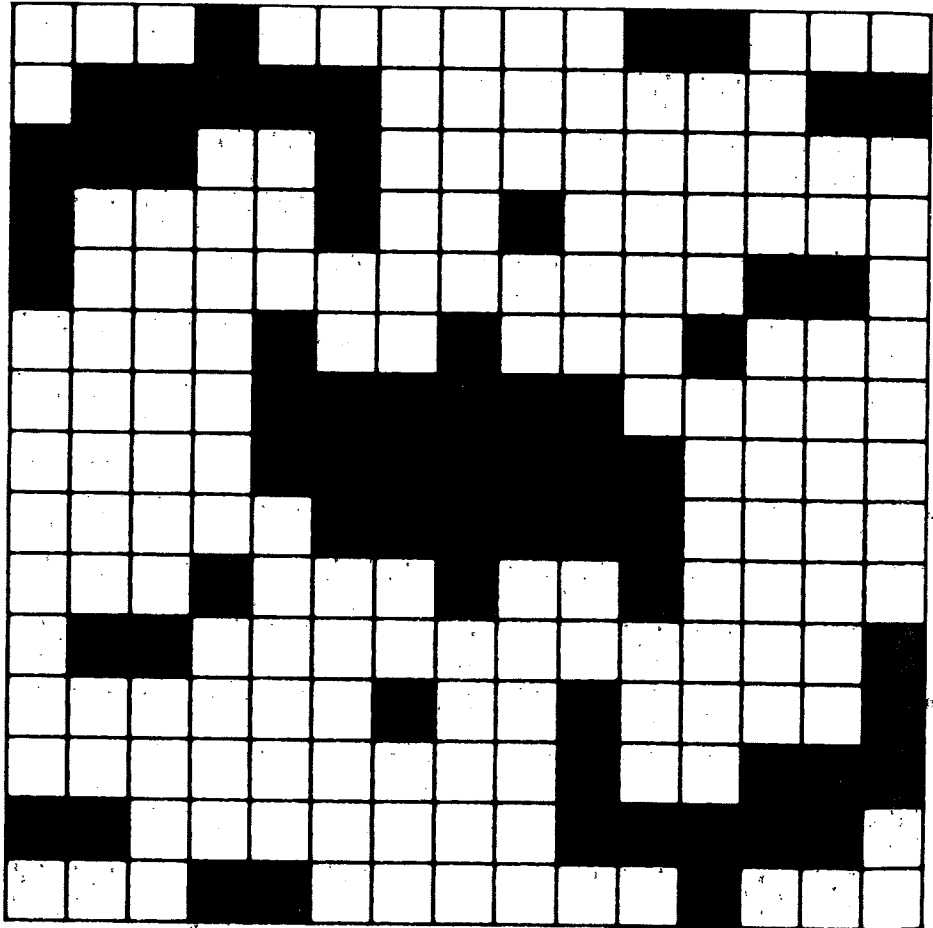
Many people enjoy working the crossword puzzle in the daily newspaper. It is also fun and a good challenge to develop this type of word puzzle yourself. The actual construction of the puzzle pattern, however, can be very tedious and time-consuming.

The following program will speed up this part of the puzzle-making process. This will free your time for what we consider the most enjoyable and creative part of crossword puzzle development: you can spend your time searching for appropriate and interesting words and their definitions to use in a particular crossword puzzle pattern.

Here, we emphasize the construction of a 15 by 15 square crossword puzzle with the restriction that no less than 25% of the puzzle be composed of black squares. It should also be mentioned that the usual symmetry of crossword puzzle patterns is about the middle square. This means that the puzzle looks the same upside-down as rightside-up.

This program gives you two possible options. If you wish to construct a particular crossword puzzle pattern, you can do so. If, on the other hand, you wish to let the computer generate a pattern for you, this option is available.

Even though a puzzle pattern is randomly generated (at least with respect to the random number generator of a particular computer), some restrictions must be imposed to obtain a "good" crossword puzzle pattern. For example, we feel that such a pattern should have at least two black squares in each row and each column. In addition, an effort should be made to keep a group of white squares from being surrounded by black squares. However, in the final analysis, you are the judge of the utility of the crossword puzzle pattern that your computer generates. You might decide that a particular output could



Above is an example of a randomly generated crossword pattern. Its output is composed of dashes and asterisks. To have a more workable copy, we usually shade in the black squares and draw solid lines through the dashes.

be improved by darkening some additional squares or by changing some black squares to white. Regardless of how you modify the puzzle pattern, we think that your enjoyment and understanding of crossword puzzle construction will be increased. The following program notes should help you understand the program and modify it for your particular needs.

Program Notes

This program is written in North Star Basic and is offered in "menu form" with six subroutines which give some structure to the program.

Backwards slashes (line 1120) indicate

the end of a statement and give the option of a line with multiple statements.

The device number for the printer in this particular setup is (line 1800). Your system setup may be different.

The North Star dialect of Basic has an EXIT statement. Here, it is used to exit from a FOR-NEXT loop before the loop is completed (lines 1440 and 1490).

The array A is used to store the 15 by 15 crossword puzzle pattern. Since two-dimensional arrays are not available in this Basic, the entry in the Ith row and the Jth column is determined by the formula: $A(15*(I - 1) + J)$. See, for example, line 1320.

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Crossword Puzzle, continued...

The range of from 27 to 32 black squares determined by Subroutine I affords a range of from 54 to 64 black squares in the total crossword puzzle pattern. This range can be adjusted by modifying line 1210.

An "enhancement" is implemented by Subroutine IV in an effort to avoid having a group of white squares completely surrounded by black squares or borders. If this should occur, you will probably wish

to darken any such white squares. Thus, every white square should be accessible to every other white square by horizontal and vertical paths.

In Subroutine III, the number of black squares in a pattern before enhancement has a range of 2 to 5 in each row and each column. This is just a personal preference which can be changed by modifying lines 1440 and 1490. □

Listing.

```

1000 REM ***** PROGRAM *****
1010 REM TO OUTPUT A 15X15 CROSSWORD PUZZLE PATTERN .
1020 REM *****
1030 REM
1040 REM
1050 DIM A(225),S$(76),T$(76)
1060 PRINT "REMINDER! TURN ON YOUR PRINTER !"
1070 PRINT
1080 PRINT "IF YOU WANT TO CONSTRUCT YOUR OWN CROSSWORD PUZZLE"
1090 PRINT "PATTERN, TYPE Y , ELSE TYPE N ."
1100 INPUT R$
1110 IF R$ = "N" THEN 1130
1120 GOSUB 1980 \ GOSUB 1780 \ END
1130 GOSUB 1200\GOSUB 1300\GOSUB 1410\GOSUB 1580\GOSUB 1780\END
1140 REM
1150 REM ***** SUBROUTINE I *****
1160 REM TO RANDOMLY DETERMINE ( WITH A RANGE FROM 27 TO 32 ) THE
1170 REM NUMBER OF BLACK SQUARES IN THE CROSSWORD PUZZLE PATTERN .
1180 REM *****
1190 REM
1200 PRINT "I AM WORKING ....."
1210 N=INT(RND(-1)*6)+27
1220 FOR I=1 TO 225 \ A(I) = 0 \ NEXT I
1230 RETURN
1240 REM
1250 REM ***** SUBROUTINE II *****
1260 REM TO RANDOMLY POSITION THE BLACK SQUARES OF THE CROSSWORD
1270 REM PUZZLE PATTERN .
1280 REM *****
1290 REM
1300 FOR X=1 TO N
1310 J=INT(RND(-1)*15+1) \ I = INT(RND(-1)*15+1)
1320 A(15*(I-1)+J)=1 \ A(15*(15-I)+16-J)=1
1330 NEXT X
1340 RETURN
1350 REM
1360 REM ***** SUBROUTINE III *****
1370 REM TO COUNT AND CHECK THE NUMBER OF BLACK SQUARES IN EACH ROW
1380 REM AND IN EACH COLUMN .
1390 REM *****
1400 REM
1410 FOR J=1 TO 15
1420 Z = 0
1430 FOR I=1 TO 15 \ Z = Z+A(15*(J-1)+I) \ NEXT I
1440 IF Z<2 OR Z>5 THEN EXIT 1130
1450 NEXT J
1460 FOR J=1 TO 15
1470 Z = 0
1480 FOR I=1 TO 15 \ Z = Z+A(15*(I-1)+J) \ NEXT I
1490 IF Z<2 OR Z>5 THEN EXIT 1130
1500 NEXT J
1510 RETURN
1520 REM
1530 REM ***** SUBROUTINE IV *****
1540 REM TO ENHANCE (WITH RESPECT TO DISTRIBUTION OF BLACK SQUARES)
1550 REM THE CROSSWORD PUZZLE PATTERN .
1560 REM *****
1570 REM
1580 PRINT " A PUZZLE PATTERN HAS BEEN GENERATED. IT WILL BE PRINTED "
1590 PRINT " ON YOUR PRINTER AFTER IT HAS BEEN ENHANCED ."
1600 FOR I=1 TO 15
1610 FOR J=2 TO 14
1620 IF A(15*(I-1)+J-1)<>1 OR A(15*(I-1)+J+1)<>1 THEN 1640
1630 A(15*(I-1)+J)=1
1640 NEXT J
1650 NEXT I
1660 FOR J=1 TO 15
1670 FOR I=2 TO 14

```

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Crossword Puzzle, continued...

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1680 IF A(15*(I-2)+J)<>1 OR A(15*I+J)<>1 THEN 1700
1690 A(15*(I-1)+J)=1
1700 NEXT I
1710 NEXT J
1720 RETURN
1730 REM
1740 REM ***** SUBROUTINE V *****
1750 REM TO PRINT THE CROSSWORD PUZZLE PATTERN
1760 REM *****
1770 REM
1780 T$=""
1790 T$=T$+T$
1800 PRINT #2 T$
1810 FOR J=15 TO 1 STEP -1
1820 S$="!"
1830 FOR I=1 TO 15
1840 IF A(15*(I-1)+J)=0 THEN 1870
1850 S$=S$+*****!
1860 GOTO 1880
1870 S$=S$+"!"
1880 NEXT I
1890 PRINT #2 S$ \ PRINT #2 S$ \ PRINT #2 T$
1900 NEXT J
1920 RETURN
1930 REM
1940 REM ***** SUBROUTINE VI *****
1950 REM TO GENERATE A PARTICULAR CROSSWORD PATTERN
1960 REM *****
1970 REM
1980 PRINT " TYPE IN THE ROW NUMBER AND THEN THE COLUMN"
1990 PRINT " NUMBER OF THE SQUARE YOU WISH TO BE BLACK, THE"
2000 PRINT " ROW NUMBER NEED ONLY BE BETWEEN 1 AND 8 AND"
2010 PRINT " THE COLUMN NUMBER NEED ONLY BE BETWEEN 1 AND "
2020 PRINT " 15 SINCE THE PUZZLE PATTERN IS TO BE SYMMETRIC"
2030 PRINT " ABOUT THE MIDDLE SQUARE ( ROW 8, COLUMN 8 ),"
2040 PRINT " WHEN YOU ARE FINISHED, INPUT 0, 0 ."
2050 INPUT " ENTER ROW, COLUMN ", J, I
2060 IF I=0 AND J=0 THEN RETURN
2070 A(15*(I-1)+J)=1 \ A(15*(15-I)+16-J)=1
2080 GOTO 2050
    
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