

\*

\*

2=A21#AND#A1#OR#3=A21  
+B1+A2+AJ1+A20+B2+AJ2+AJ20+B20  
+B2+A3+AJ2+A1+B3+AJ3+AJ1+B1  
+B20+A1+AJ20+A19+B1+AJ1+AJ19+B19  
+C1+B2+A1+B20+C2+A2+A20+C20  
+C2+B3+A2+B1+C3+A3+A1+C1  
+C20+B1+A20+B19+C1+A1+A19+C19  
+A1+AJ2+AI1+AJ20+A2+AI2+AI20+A20  
+A2+AJ3+AI2+AJ1+A3+AI3+AI1+A1

## Sheet1

+A20+AJ1+AI20+AJ19+A1+AI1+AI19+A19

```
{edit}{home}{del}~/xr
{home}{end}{down}/m{up}{up}~{home}{end}{right}{pgdn}~{home}/m~{pgdn}{pgdn}~
{down}/m{end}{down}~{home}{pgdn}~{home}{pgdn}{end}{down}/m{up}{up}~
{home}{pgdn}{right}~{end}{up}/m{right}{end}{right}~{end}{down}{up}~
{end}{down}/xc\~{right}/xc\~/c~.{end}{right}{left}~{end}{right}/xc\~
{end}{up}/xc\~/c~.{end}{down}{up}~{up}/xc\~{end}{left}/xc\~/c~.{end}
{right}{left}~{left}/xc\~{down}/xc\~/c~.{end}{down}{up}~{right}/xc\~
/c~.{end}{right}{left}{end}{down}{up}~{home}{pgdn}{pgdn}/xc\~/c~.{up}
{end}{right}{pgdn}~{pgdn}/rnd\Z~/rnc\Z~~{down}/rnd\~/rnc\~/~{xg\~
{calc}/xg\Z~
{home}+A41~/c~.{pgdn}{end}{right}{up}~{goto}\~/re~
```

\D

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## Sheet1

ZLIFE...a 1-2-3 Release 1A worksheet that sets you up for LIFE!

=====

In LIFE, a cell is born in the next generation if its (empty) place in this one is surrounded by exactly three live cells; a cell survives into the next generation if it's surrounded in this one by two or three live cells; and a cell dies before the next generation if it's surrounded by more than three or fewer than two live cells.

In this worksheet, ZLIFE, macro Z sets things up so LIFE can evolve on the [Home] page. Run macro Z by pressing [Alt][Z]. Or read on if you like - or don't have ZLIFE on disk. What follows is enough to let a macro enthusiast recreate ZLIFE. But you don't have to do that...  
...ZLIFE is now on the same disk as Z-macros (tm), \$15 by mail from

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John Conway, a Cambridge mathematician, described LIFE in the Sixties. For LIFE's place in the unbelievably rich field of Cellular Automata, see The Portable Universe by Steven Levy in Whole Earth Review #49, Winter 1985. Levy says "...the game of LIFE took on a life of its own in late 1970 when Martin Gardner, a columnist for Scientific American, wrote about Conway's experiment." Gardner's report was printed in the October 1970 issue of Scientific American, pp 120 - 123. Go to your library and check it out. (For some LIFE forms reported you'll need a bigger worksheet, like ZLIFE2 - coming soon)! Conway first ran LIFE on a DEC PDP-7, but YOU can do it on a PC with 1-2-3!

The rules of LIFE, given in English on the [Home] page, are shown as the following 1-2-3 formula : 2=A21#AND#A1#OR#3=A21 . (Z copies the formula all over that third page).

Z moves the formulas from the nine cells below the rules of LIFE to their proper places on the second page, and copies them to other cells on that page.

After you've run Z, you can always get back here with [F5][F3][Enter].

Macro D, below, sets up this demo. The comment tells how it does it.

```
0 0 0 0 0 0 0
0 0 0 0 0 0 1
0 0 0 0 0 0 1
0 0 0 0 0 0 0
0 0 0 0 0 0 0
```

```
{goto}\D~{end}{up}/c{end}{right}{end}{down}~
{home}{down}{down}{down}{down}{down}{down}{down}~
{calc}{home}/c~.{end}{right}{pgdn}{up}~/xq
```

Run D. When it's through, it leaves you on the [Home] page where you can run Z. Z runs until you press [Ctrl][Break] (and then [Esc]). Of course, you can make changes on the [Home] page yourself: enter a 1 for each new live cell, 0 for a dead one. Then press [F9]. Copy an unchanged cell over your changes, and run Z.

The colony of six live cells on the left turns out to be stable. You can get some action by adding another live cell to make an unstable colony like the one on the right. For the demo, you don't need to do any adding - just run macro A. But when you've run A, and run Z, and the whole issue is stable once more, you can experiment by adding yet another live cell. If you add it at the bottom right of the lowest colony on the screen, you'll eventually see a "glider" evolve. That's a colony that cycles through a series of shapes and moves across to the edge of the screen and wraps itself around to the other side - and keeps on going until it meets another colony.

Remember to press [F9] after making your changes, and then copy an unchanged cell over the ones you've changed before you run Z again. After you've done the copying, the CALC indicator will come on again. You can ignore it this time because your next step is to run Z, and the runtime version of macro Z contains {calc}.

## Sheet1

Seems that with LIFE you get Order out of Chaos. Makes you wonder...

```
\Z {home}{down}/re{end}{down}
{end}{right}~{end}{down}
/m{end}{down}{end}{down}{end}{down}~
{home}~{home}{end}{down}{end}{down}
/rnc\~~{down}/rnd\Z~/rnc\Z~~
{end}{down}/m{up}~{home}
{pgdn}{pgdn}{pgdn}~/xg\Z~
```

Second page has general format.

## Sheet1

Global format is +/-, column width  
2, recalculation rowwise, manual.

1	0	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1
0	0	0	0	0	0	1	0
0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	1



Sheet1

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0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0

Copy range above to  
[Home] screen. Press  
[F9] and copy [Home]  
cell over changes.