Modelling Forest Fires Worksheet Solutions

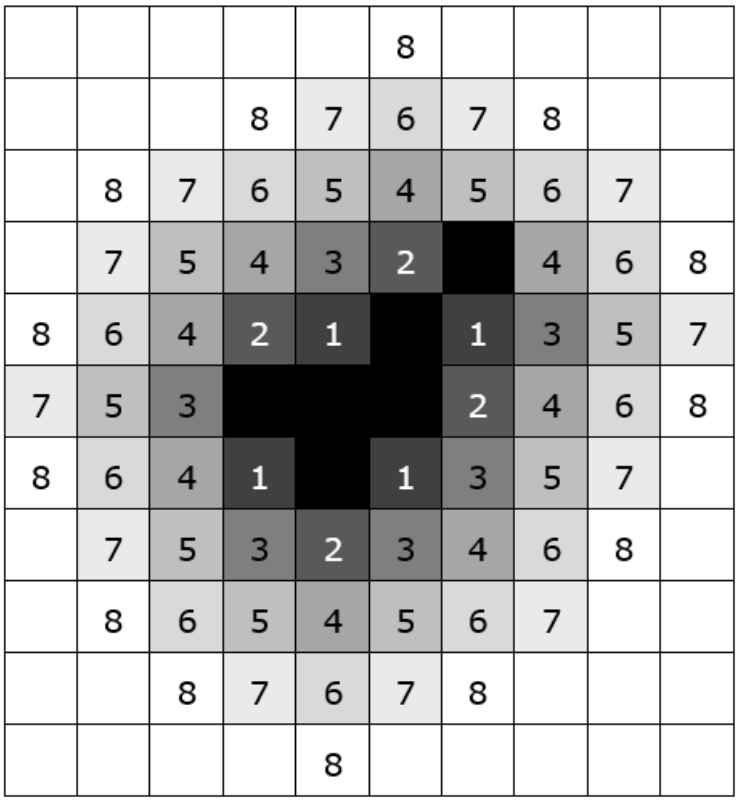
Worksheet 1: Spreading Dye/Game of Life

Spreading Dye

The black squares are stained with a dye. Empty cells (squares) which have **three or more** dyed neighbours become dyed. Cells which become dyed stay dyed. The dye spreads in time-steps, with all changes happening **once per time-step**. Model the spread of the dye on the diagram below. *It is easiest to use a new colour/pattern for each time-step so that you can mark the spread of the dye as you go along.*

For **each** time-step:

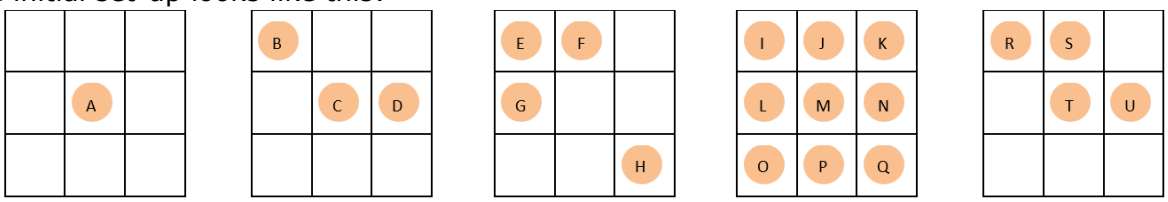
1. Choose a new colour.
2. Work out which cells have any dyed neighbours. Mark these with a dot.
3. For each dotted cell, work out whether it will become dyed – it must have 3 or more neighbours that became dyed **before this time-step**. If yes, colour in the cell.
   Top tip: don't forget the diagonals, and make sure you are not counting cells dyed in this time-step (i.e. coloured in using your current colour).
4. Once you have worked out all the cells which will become dyed it is the end of the current time-step. The cells you have just coloured in are now classed as dyed.



Time-step	# new cells dyed
0	*6 – already marked*
1	4
2	4
3	6
4	8
5	9
6	11
7	12
8	13

Counting Neighbours

The initial set-up looks like this:



1. How many neighbours does each counter have? Fill in the table below.

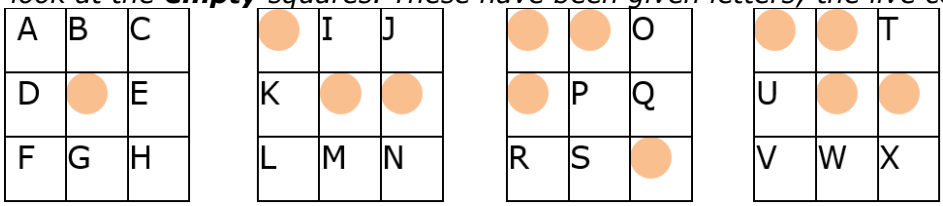
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
0	1	2	1	2	2	2	0	3	5	3	5	8	5	3	5	3	2	3	3	2

2. In the above arrangements, which live cells will die from loneliness? A, B, D & H

3. Which live cells will die from overcrowding? J, L, M, N & P

4. Which live cells will stay alive? C, E, F, G, I, K, O, Q, R, S, T & U

*Now look at the **empty** squares. These have been given letters; the live cells are dotted.*



5. How many neighbouring live cells does each empty cell have? Fill in the table below:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
1	1	1	1	1	1	1	1	3	2	2	1	2	2	1	4	2	1	2	3	3	1	2	2

6. Where will there be a new birth? I, T & U

Notes: Worksheets 2 & 3

There are no 'answers' to these, as what the students do will depend on the dice rolls. However, make sure they are rolling the dice once for **every** burning neighbour a tree has, and that if a tree did not catch light on the first go round, make sure they **check it again** on the next time-step (and so on).

For worksheet 3, make sure they are putting together some simple instructions which could be followed by someone else (or even a computer). These are the basics of programming.