A Little Light Thinking

Imagine a machine that switches lights on according to certain rules.
Here are some examples of possible rules that might switch on the lights:

5n+1	6n+5	12n+4
4n	5n-3	3n+1
9n-4	10n-4	8n+3

If the rule is 8n+3, the following numbers will switch on the corresponding light: 3, 11, 19, … 83, … -13, …

For each rule, can you find a few numbers that switch on the light?

What can you say about the rules where the numbers are:

- Always even?
- Always odd?
- Alternately odd and even?

In the table below, try to fill in at least three numbers that switch on lights for both the row and column rule.

	5n-3	3n+1	9n-4	10n-4	8n+3
5n+1					
6n+5					
12n+4					
4n					

Not every cell can be filled in! Can you explain why some pairs of lights will never switch on together?

Can you find a rule to describe all the numbers that switch on a particular pair of lights?

Extension

If the two sequences are described by the rules an+b and cn+d, can you explain the conditions for determining whether the lights will ever switch on together?