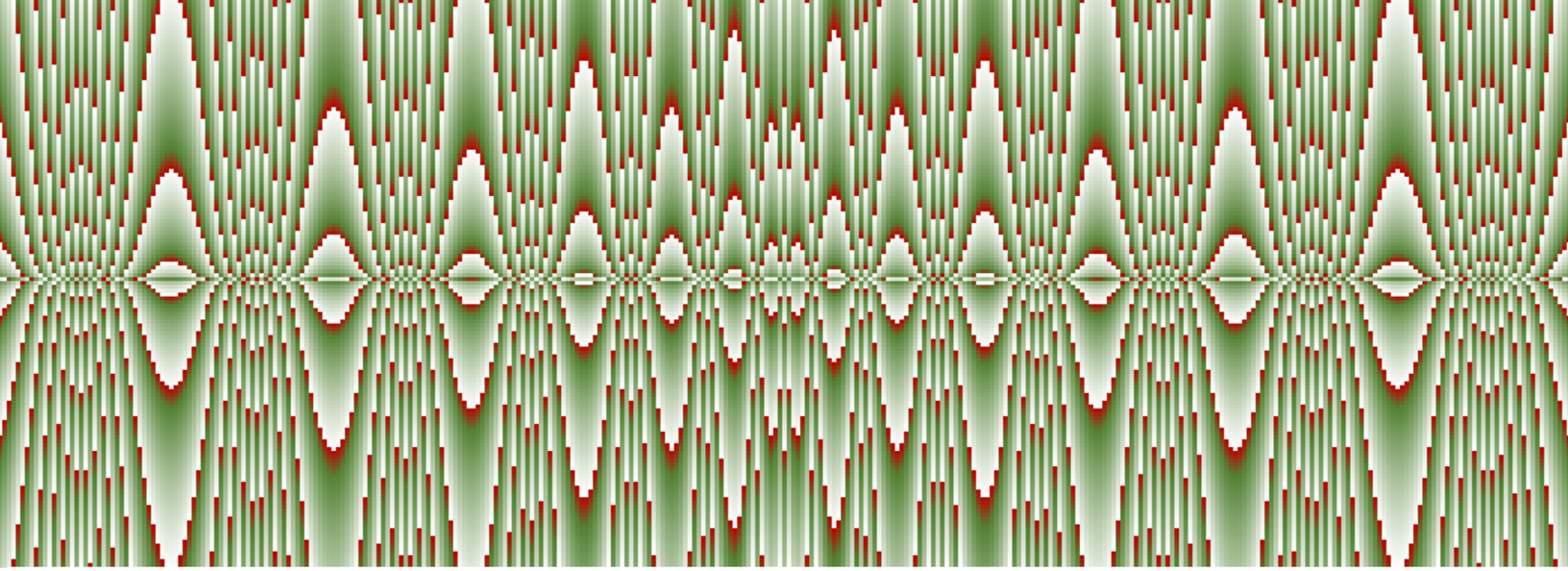
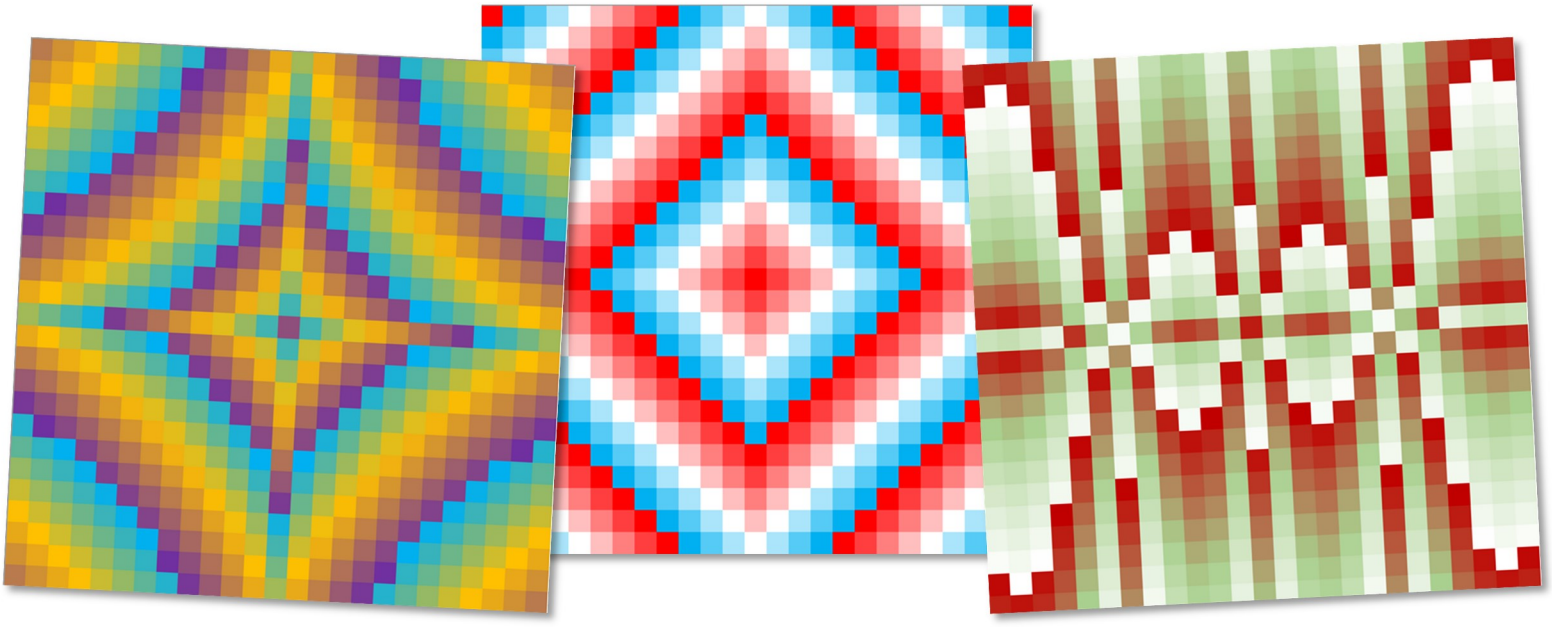


Alexander Zlatkovski

SPREADSHEET ADVENTURES

befriending Excel one puzzle at a time

BOOK 1: COLORING FUN WITH CONDITIONAL FORMATTING



Spreadsheet Adventures - Coloring Fun with Conditional Formatting

Alexander Zlatkovski

This book is for sale at http://leanpub.com/spreadsheetadventures

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Contents

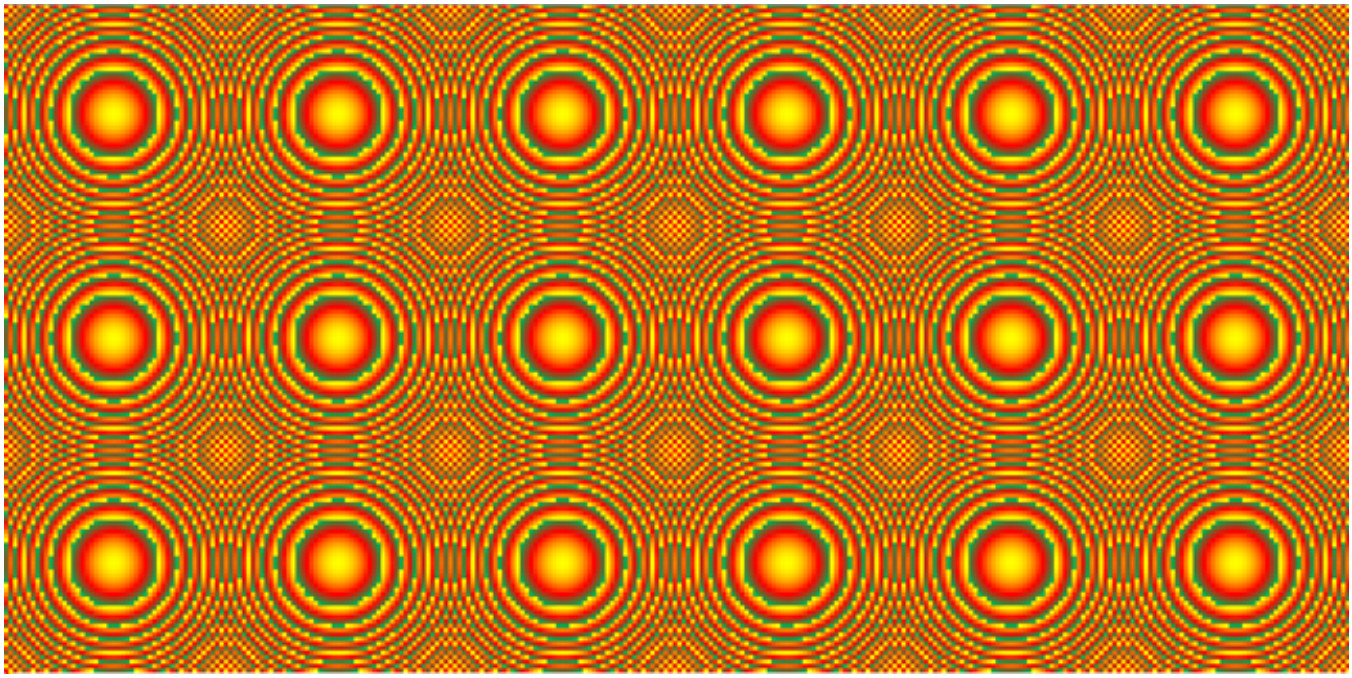
INTRODUCTION

For many years coloring books were just for kids. A few years ago, a new trend became popular: coloring for adults. According to Wikipedia:

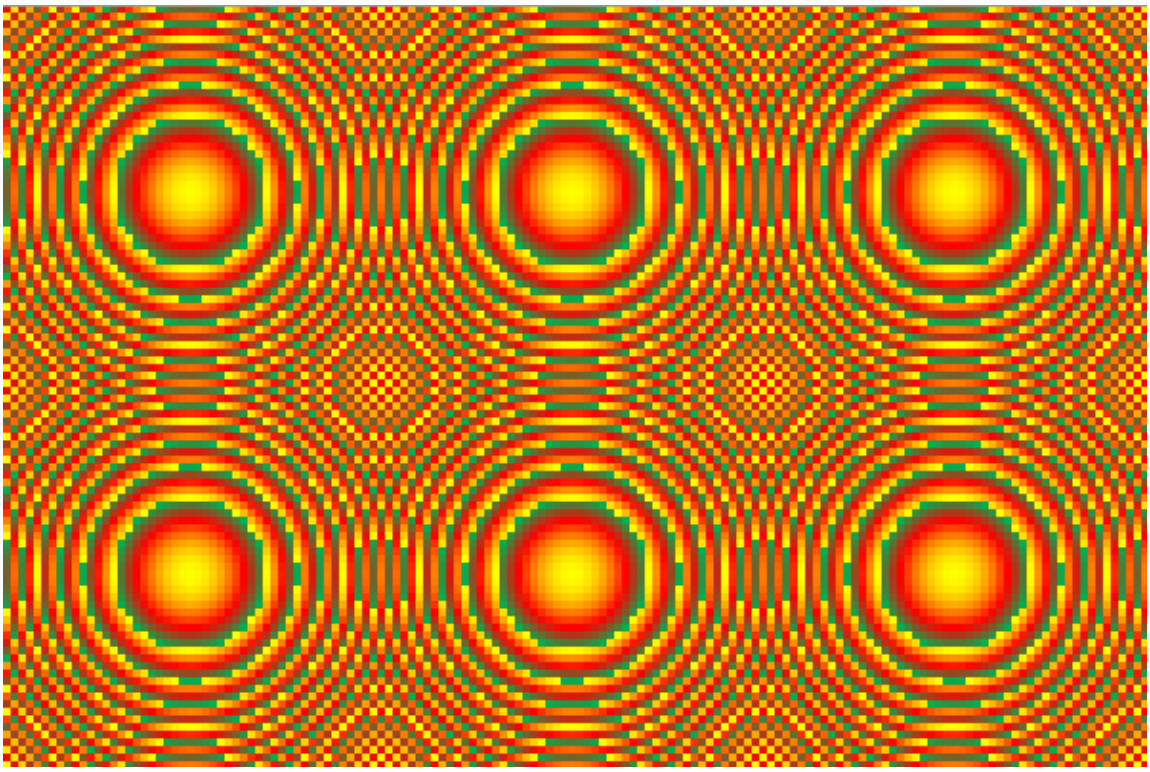
> *Adult coloring books reportedly bring people a sense of their childhood, and help with developing fine motor skills and vision, reducing anxiety and creating focus, and relieving stress and anxiety in a manner similar to meditation. Concentrating on coloring may facilitate the replacement of negative thoughts and images with pleasant ones. The books are also a way to get away from technology.*

Well… The coloring technique that I want to share with you will indeed help to create focus and reduce anxiety, and develop fine skills and vision, albeit of a different sort. But it will not take you away from technology. On the contrary, it will take advantage of it: the ability to color *en masse*, thousands of points at once; the ease of changing colors; the simple way to transform the picture, and so on. Maybe the most alluring aspect of this worksheet coloring is that you create, change, and elaborate on your own patterns instead of following somebody else's ideas.

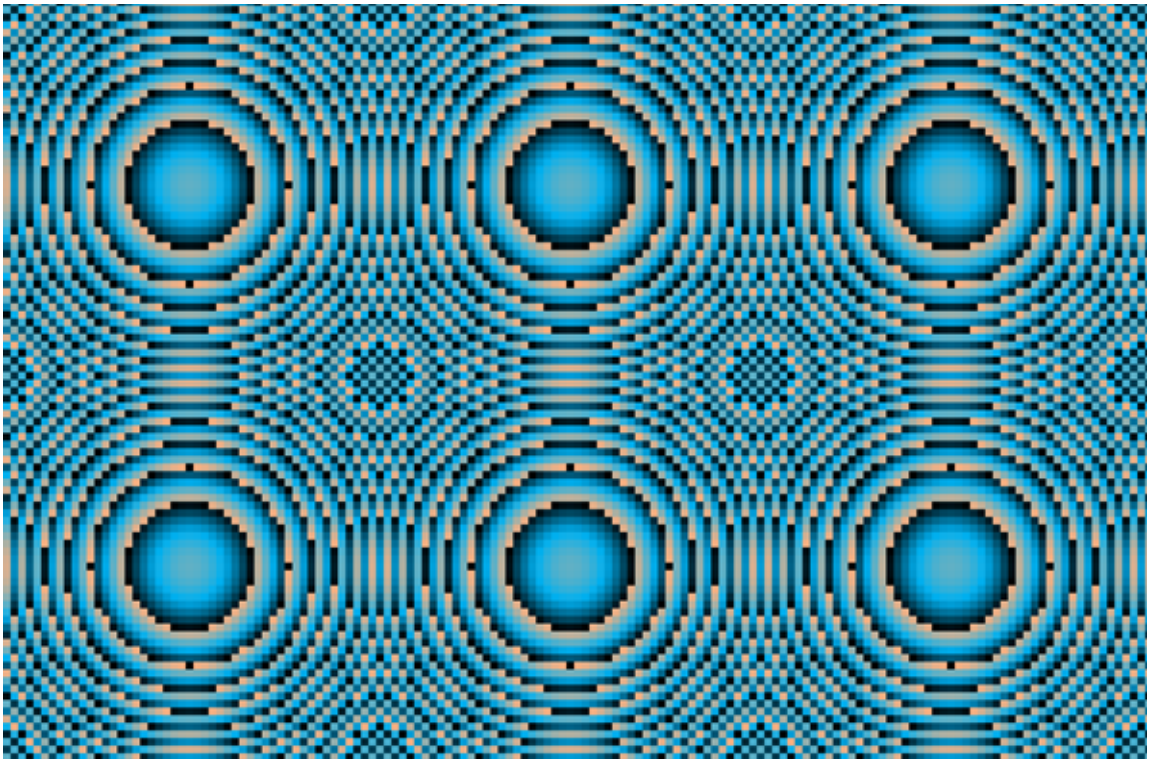
And what beautiful patterns they might be!

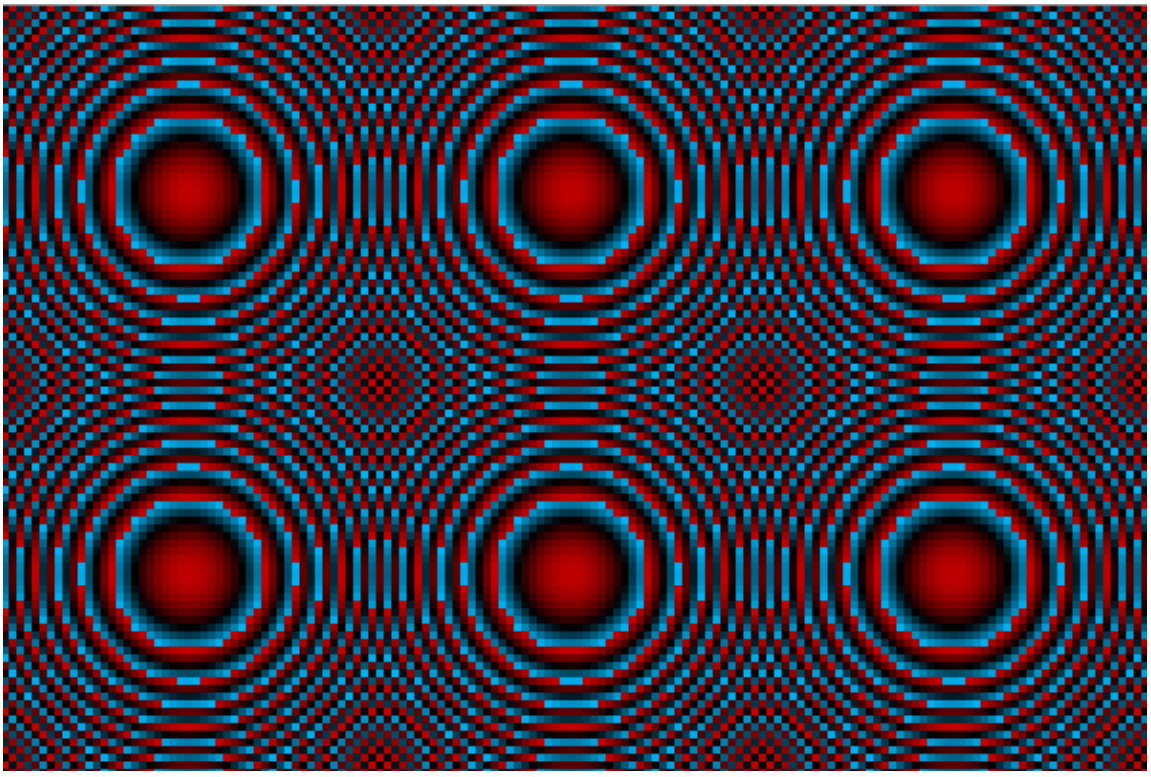


Here is a close-up of the same picture:

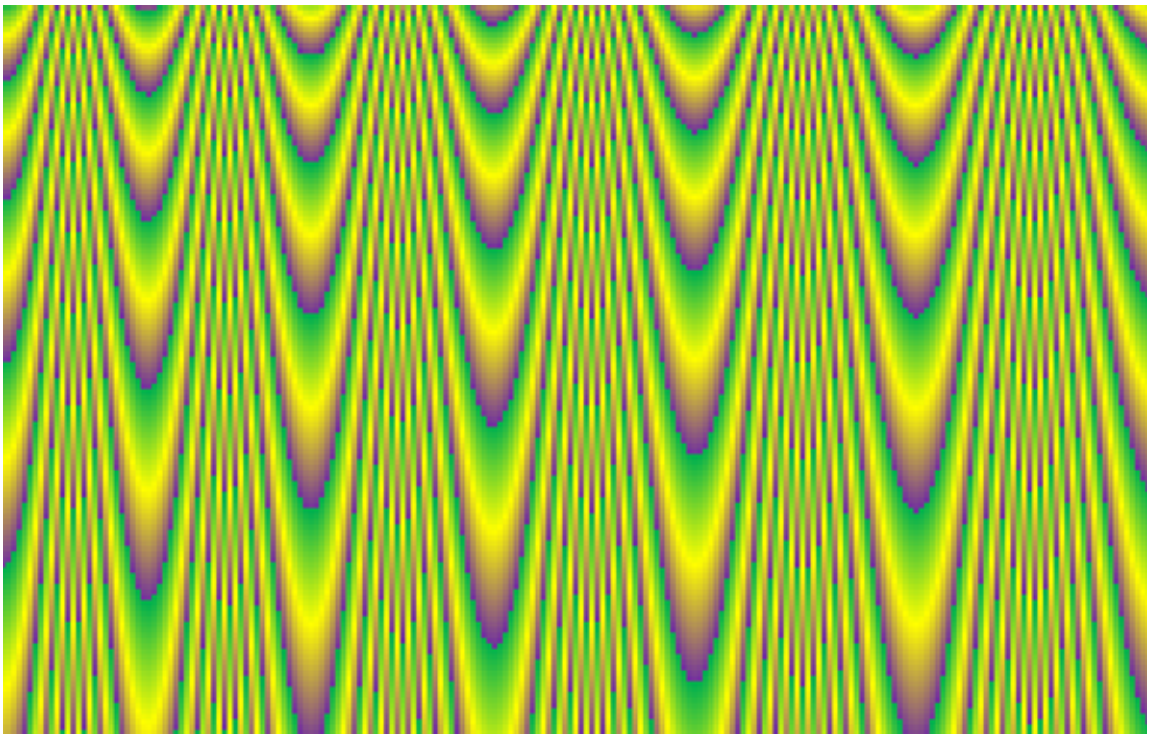


Want to change colors? A couple of clicks, and you're done:





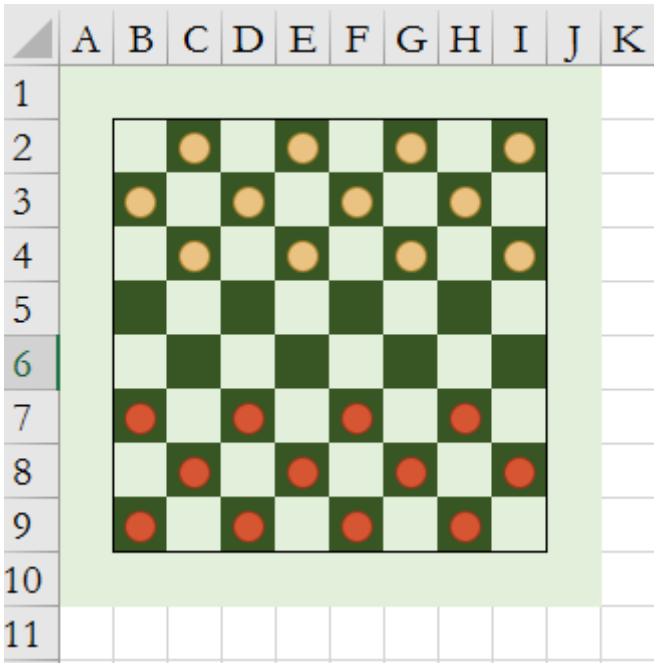
Want to change the shape? Just tinker with the formula a bit (I altered three parameters here), and the pattern is transformed into something completely different:



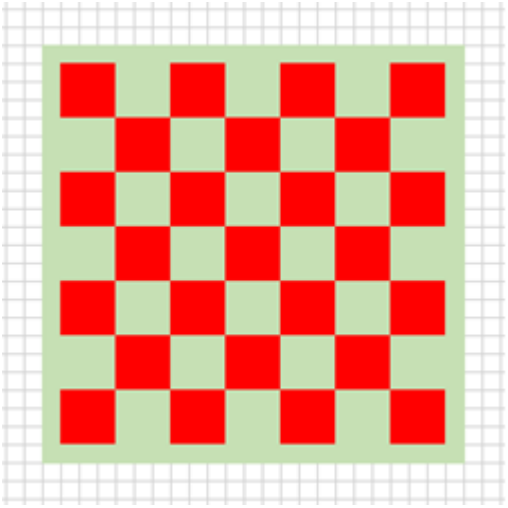
But what I like most about this pattern-making is first conceiving a picture, and then trying to find a formula or a set of formulas to create it. It is like solving puzzles.

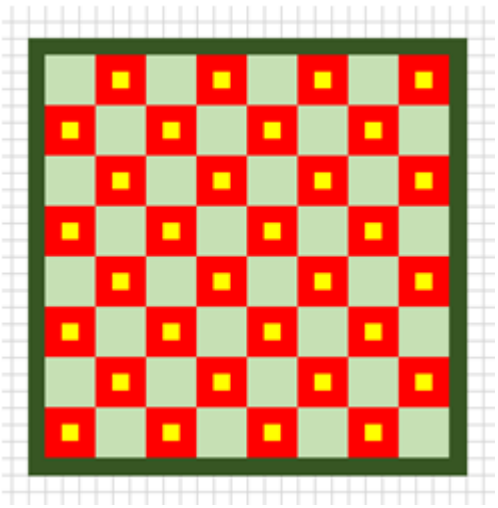
A checkerboard? Easy: there are many different ways to draw it (you will learn them soon).

Putting checkers on it? More interesting!

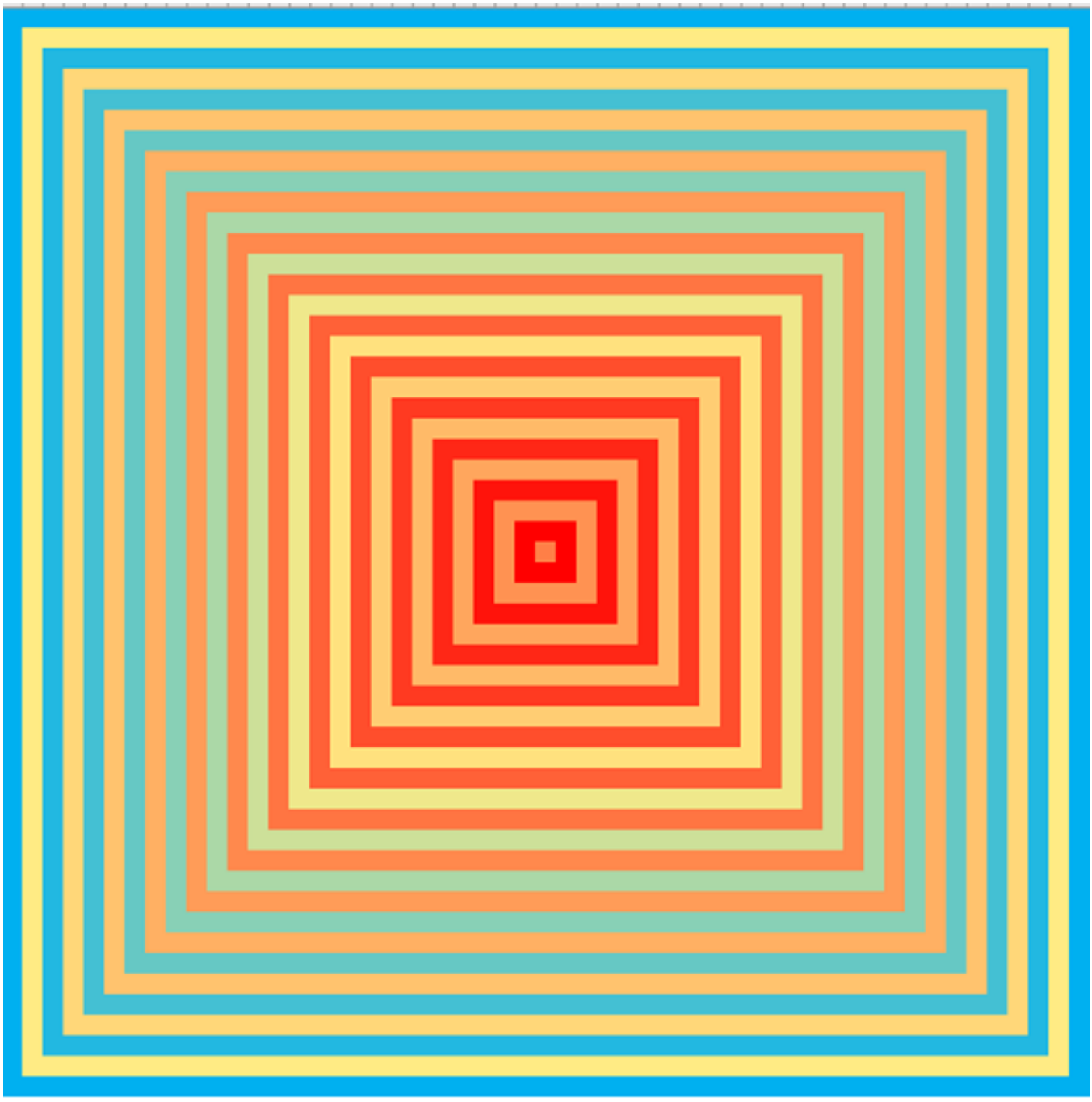


A checkerboard with bigger squares? The same with embellishments?

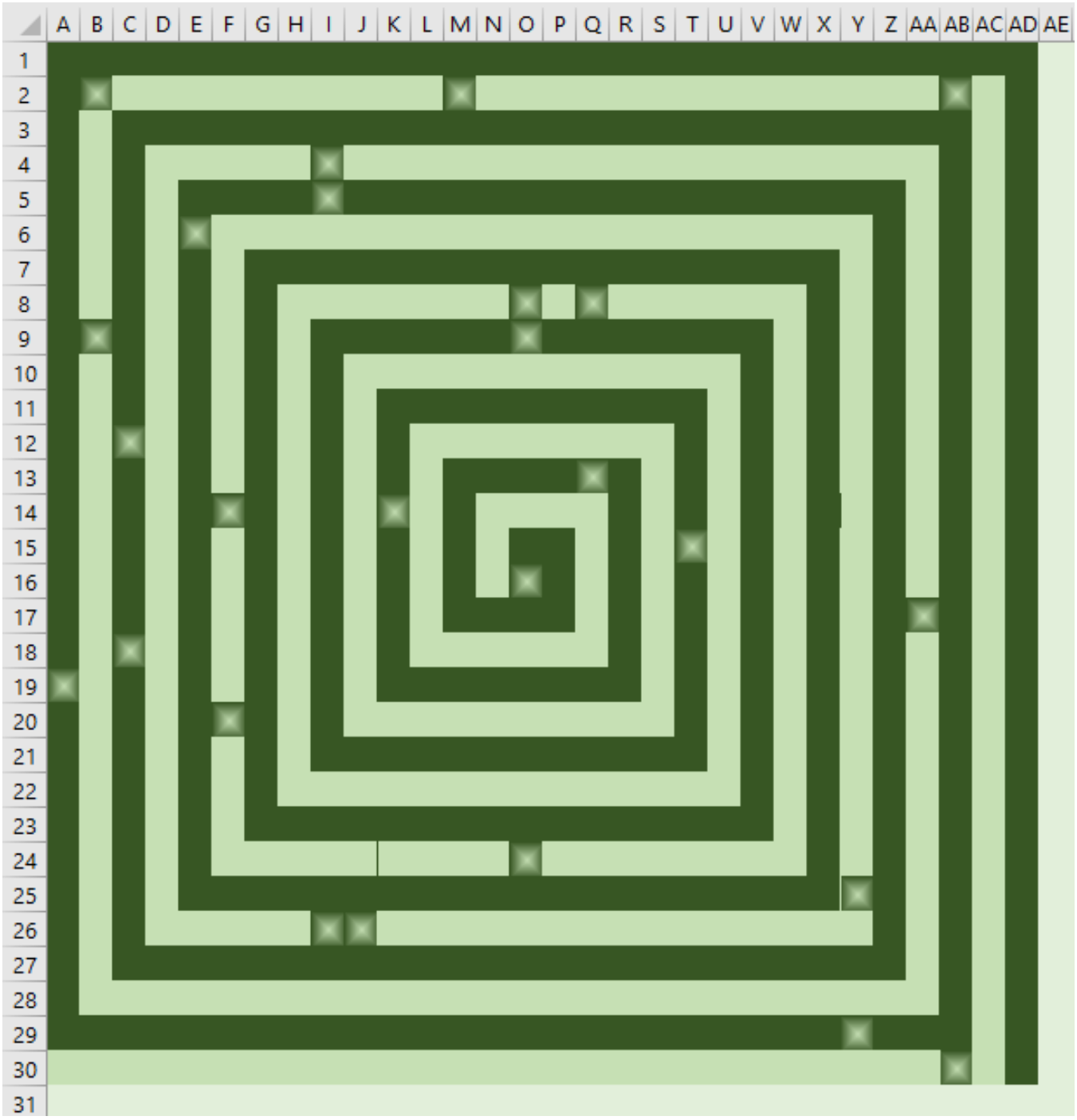




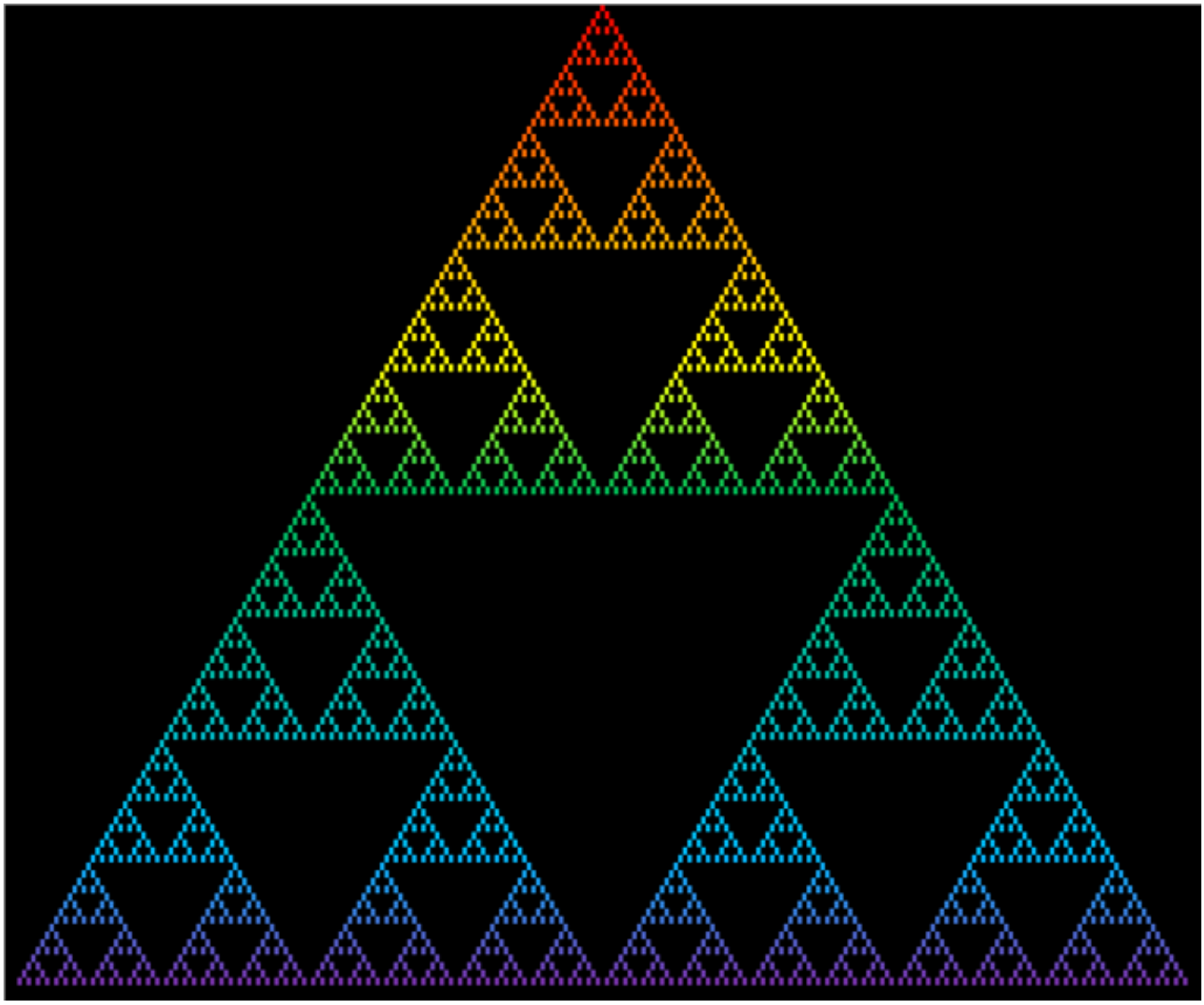
What about concentric squares with gradually changing colors? (It is actually even more elaborate: there are two sets of squares here, each set changing colors independently of the other)



How to draw a spiral? How to add some random sparks to it?

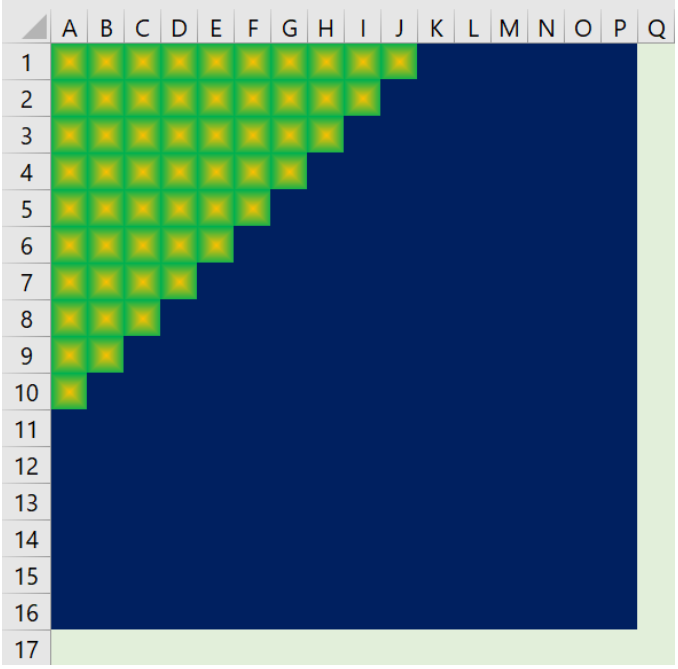


How to color a fractal structure?



The Sierpinski Sieve – the little brother of Pascal Triangle...

How to make the picture grow? How to make it move across the screen (*click **here** to animate it*)?



Remember to click the link above to animate

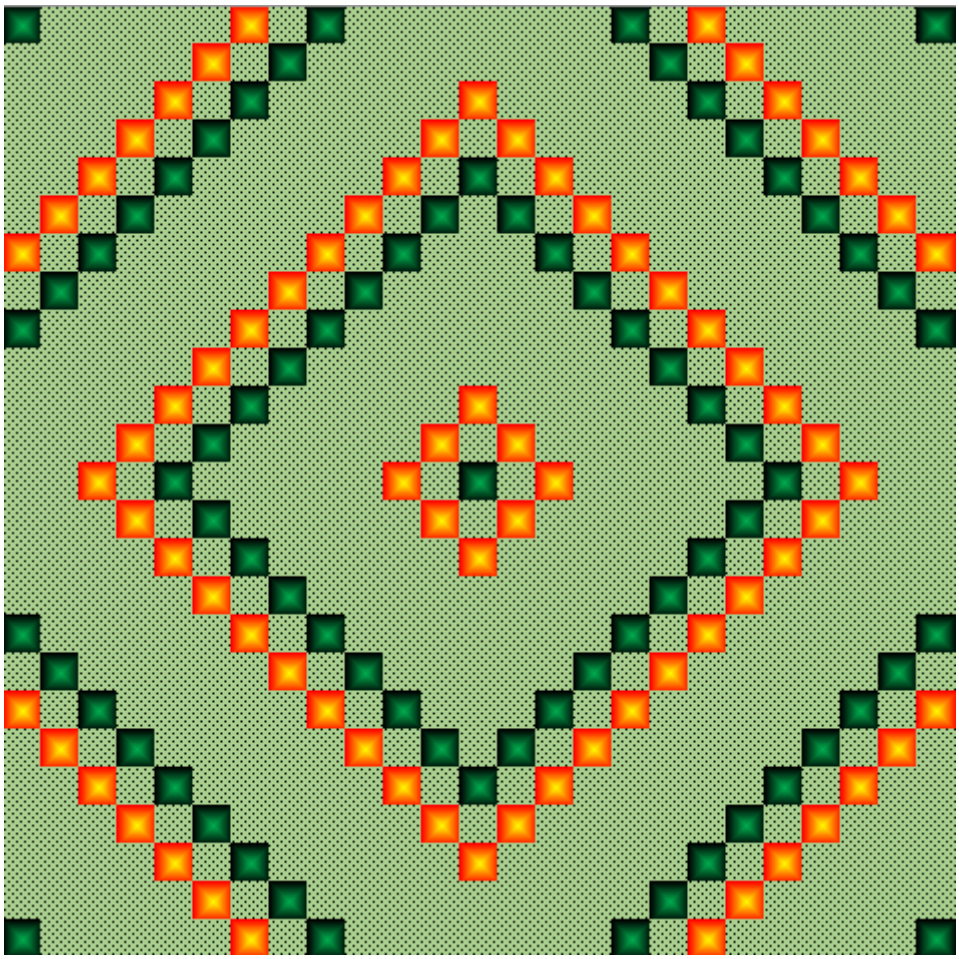
The possibilities are endless.

To draw such pictures, we will be using Conditional Formatting (CF for brevity). It is a very useful tool in the panoply of other wonderful Excel tools. It calls attention to any values within – or outside – of desirable limits. It helps to notice certain aspects of the data, marking them with different font colors, cell colors, data bars, and/or icon sets. It can catch words and numbers, highlight trends, find duplicate values, or type mismatches, etc.

In short, it makes it much easier to process, organize, and understand the data, and to present it in a user-friendly way.

It is very practical.

In this book you will find that it can also be quite entertaining.



ABOUT THIS BOOK

This book is a combo: both a textbook and a puzzles collection. Accordingly, the goal is twofold: to teach and to entertain, with an emphasis on the latter. You will learn a few logical functions (`TRUE`, `FALSE`, `AND`, `OR`, `IF`), and a few math functions (`MOD`, `ABS`, `INT`, `MAX`, `MIN`), and that will be enough to create an astonishing variety of intricate patterns. The ingredients may be simple; it is the skill of the cook that allows for making a delicious meal!

To help you acquire such skills, to let you familiarize yourself with Excel functions and their combinations, I offer a lot of puzzles. At the beginning they are rather obvious and easy, but please don't skip them! The only way to master a skill is to practice it, and the rewards of those early exercises will be reaped later, when all the essentials of Conditional Formatting – selecting the range, picking the rule, setting the format, writing and editing formulas – will become automatic.

It is like learning to play piano: the fingers need to be trained to move on their own before the pianist can enjoy the freedom of interpreting a piece: choosing a tempo and pedaling, playing softer or louder, and so forth.

Very little prior knowledge of Excel is required: all of the necessary information is presented along the way. Once I've explained a concept, though, I will assume that you know it, and will use it on the next pages without further elaboration. So, it is advisable to read the book sequentially, without skipping ahead.

Another bit of advice: when using formulas from the book, please type them; don't copy and paste! Of course it is much faster and easier to CTRL+C/CTRL+V; but it robs you of the wonderful opportunity of making – and correcting – mistakes. Again, it is the same as with piano playing: it is impossible to learn just by listening to what other pianists are doing. Hands-on experience is what we need in both cases, literally: fingers on the keyboard.

The book consists of four parts:

- **Part I** is the place where most functions are introduced and combined together. It is also the home for most of the puzzles: the engineer in you will delight in understanding how things work and constructing them from scratch.
- **Part II** deals with moving objects: you will play with "cars" and "trains", digital clocks and pulsating diamonds.
- **Part III** is the actual coloring part: it is here that you will indulge your inner artist, first refining the patterns, then choosing colors, and then picking the perfect tints and shades.

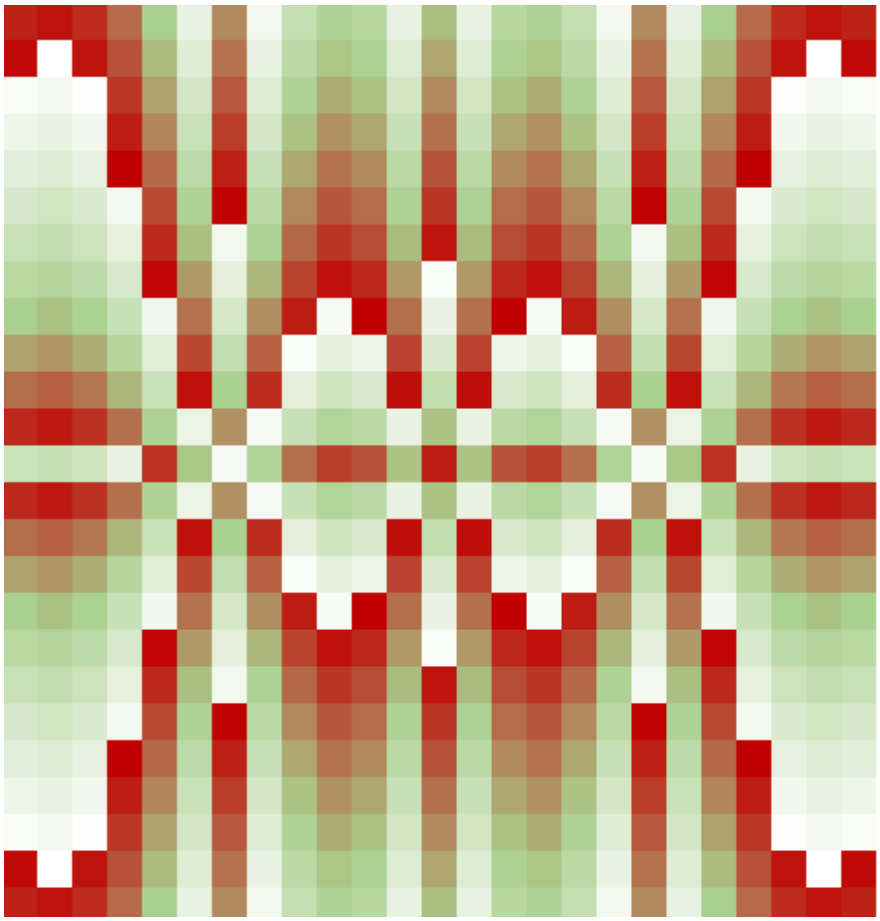
> *As part of this section, you will learn how to build the coloring pages, applying the knowledge from Parts I and II. If, however, you are mostly interested in the coloring part, without the "dirty work" of designing those pages yourself, you can just buy the companion book with the accompanying Excel files. Those albums, with the formulas already pre-filled, will supply an endless variety of patterns; then Excel will provide the paint and brushes; and you will bring your creative fantasy into the mix…*

- **Part IV** brings even more ideas and puzzles for your own enjoyment and exploration.

Finally, a humble request: having read this book, if you've enjoyed it and found it valuable, please share a link to https://leanpub.com/spreadsheetadventures/ with your friends, family, and co-workers – the more, the merrier! I would also love to hear any feedback or suggestions that you might have. If you have any beautiful patterns that you would like to share, or if you're able to write a review/testimonial, that would likewise be delightful. You can contact me via email, LeanPub's web form, or Facebook.

And now without further delay – enjoy! As Marry Poppins would undoubtedly have sung:

Just a spoonful of puzzles
Helps the formulas go down
The formulas go down
The formulas go down.
Just a spoonful of puzzles
Helps the formulas go down
In a most delightful way!



PART I: MAGIC FORMULAS

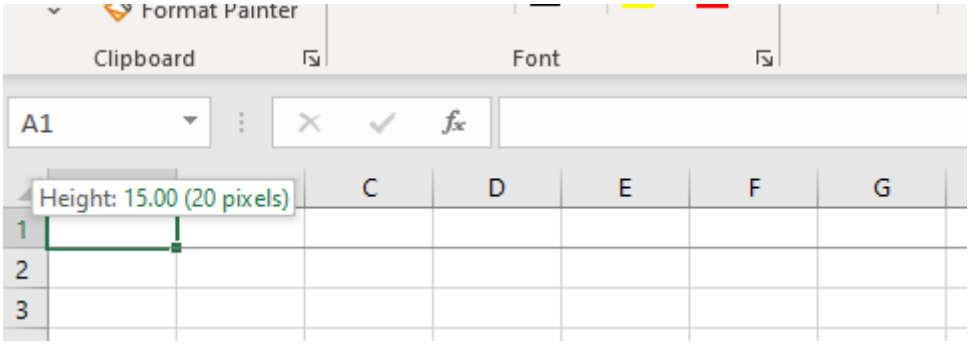
Preparing the Canvas

Excel spreadsheets usually come with cells that are about 4 times wider than they are high. For our purposes square cells look much nicer, so we need to change their proportions.

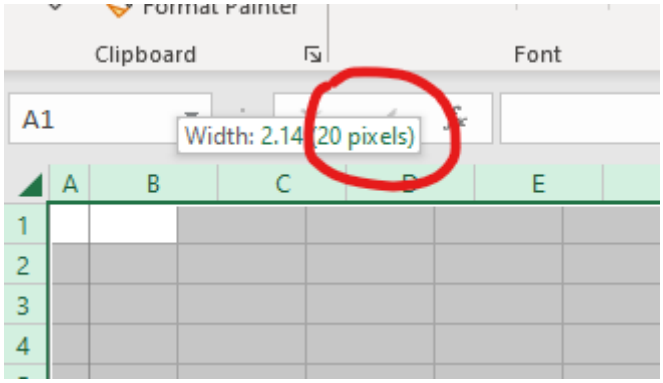
Well, it is easier said than done! Excel has a strange system for cell measurements in both dimensions: the column width is counted - I quote Microsoft - in the "*number of characters that can be displayed in a cell that is formatted with the standard font*". Ooh! That's quite a handful…

The row height is measured in points, one point being 1/72nd of an inch. There is a way to change both those measurements to inches (or centimeters), but it is quite cumbersome. Luckily, there is a shortcut!

Press and hold with your mouse on the line between the first and second row, just where row numbers are. A little yellow tooltip will pop up, showing the row height in points, followed by pixels in parentheses. Take note of the height in pixels (on my computer it is 20 pixels; yours may be different). You only need to check this number once. You can then release your mouse, without adjusting the row height.



Now select all cells on the worksheet (CTRL+A, or click with the mouse on the little triangle at the intersection of row numbers and column names), and press and hold with the mouse between column A and B. You will get another tooltip that shows the column width: in standard units and again in pixels (on my computer it is 8.43 points, which is 64 pixels). Move the mouse to the left, and the column will shrink, as well as numbers. When the width in pixels reaches the same number as we had for the height in pixels (see the number 20 below), release the mouse. Now the cells are square!



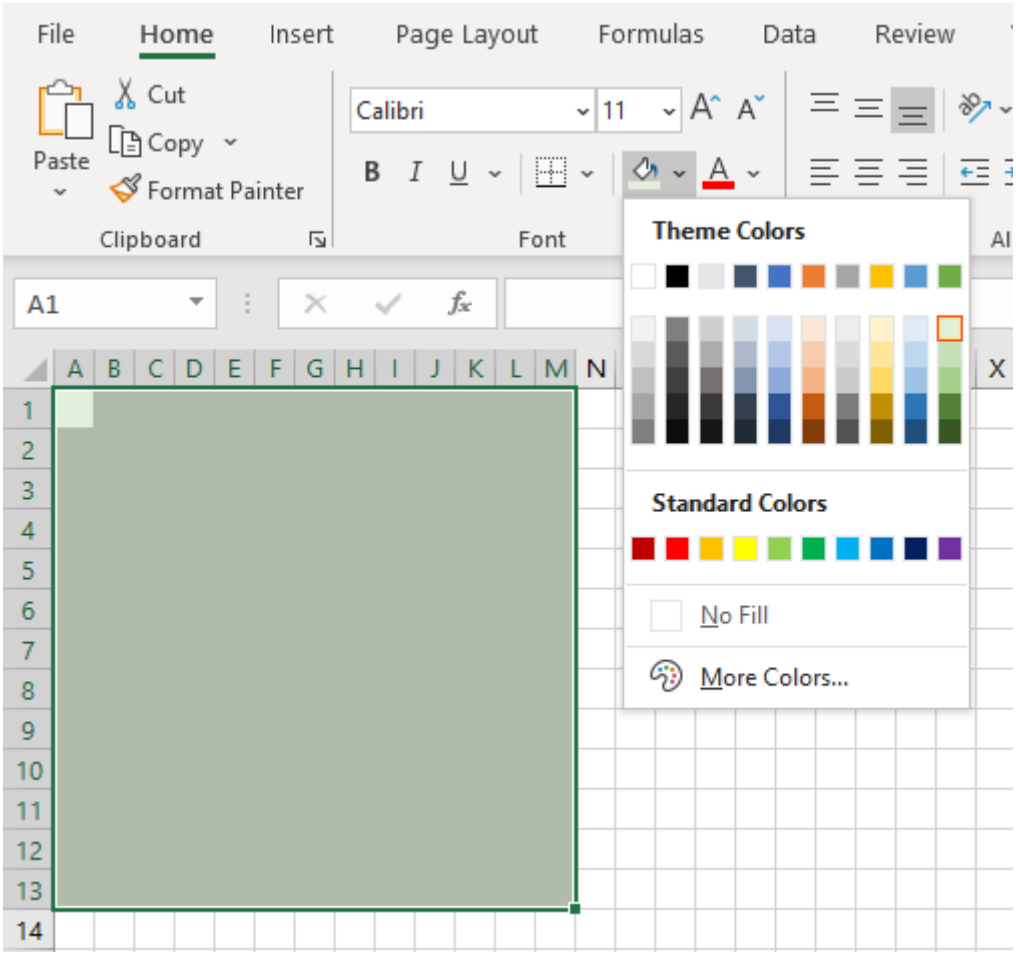
The description was long but believe me: it only takes a few seconds to do this.

Meeting the Hero

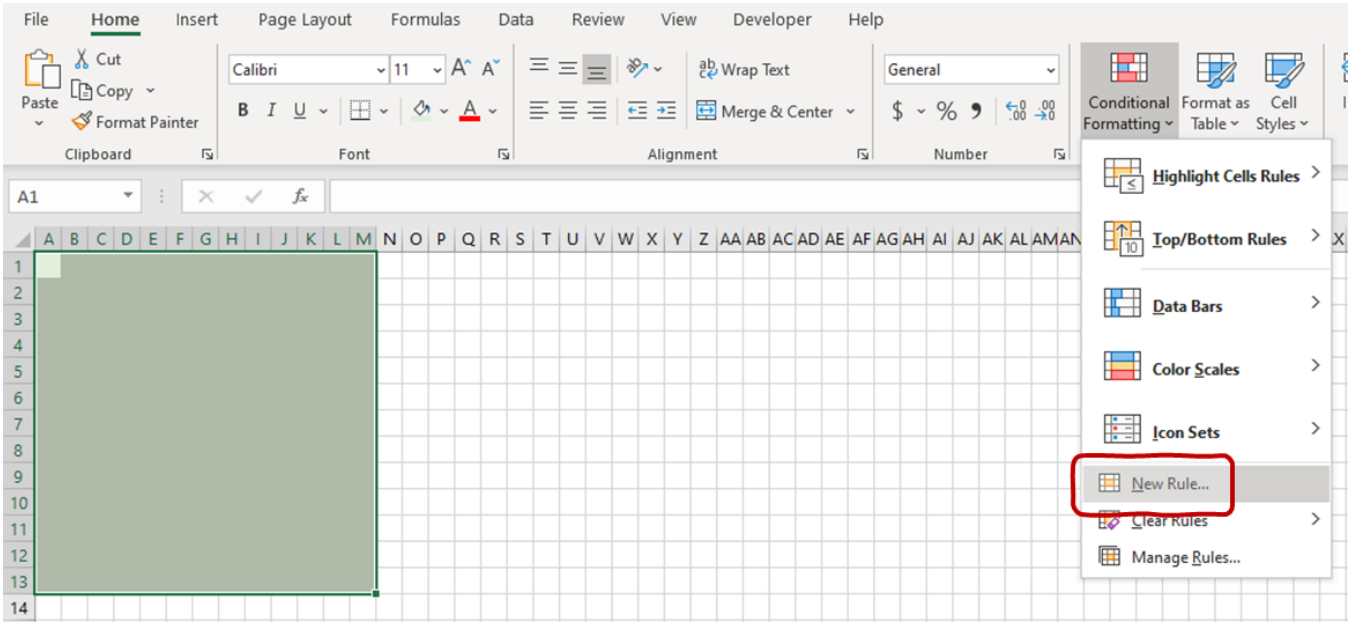
Conditional Formatting at work

The idea of Conditional Formatting is quite simple: to visually highlight certain trends in the spreadsheet. Actually, the name says it all: we want to *format* the data if it satisfies a certain *condition*.

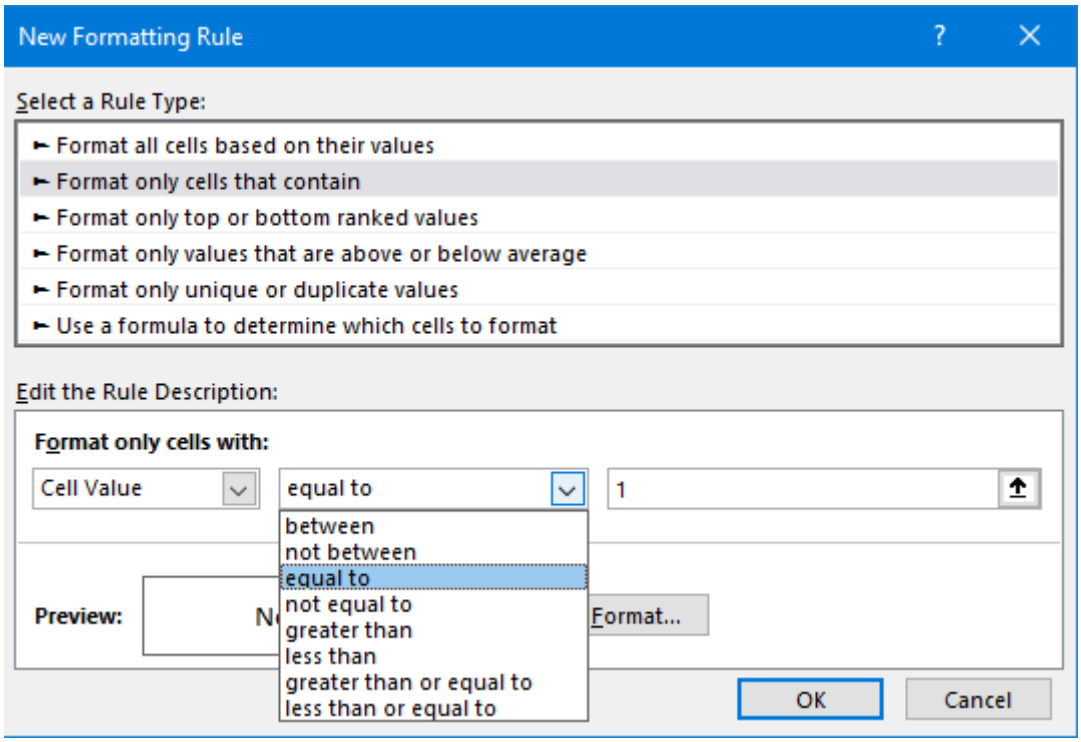
To make a first acquaintance with the hero of this book, let's select an area on the spreadsheet (for the next few examples it will be a square 13x13 from A1 to M13) and click on **Fill Color** button on the **Home** tab to pick a background color. I picked a light green:



While the area is still selected, go to the **Home** ⇒ **Conditional Formatting** and click on **New Rule**:

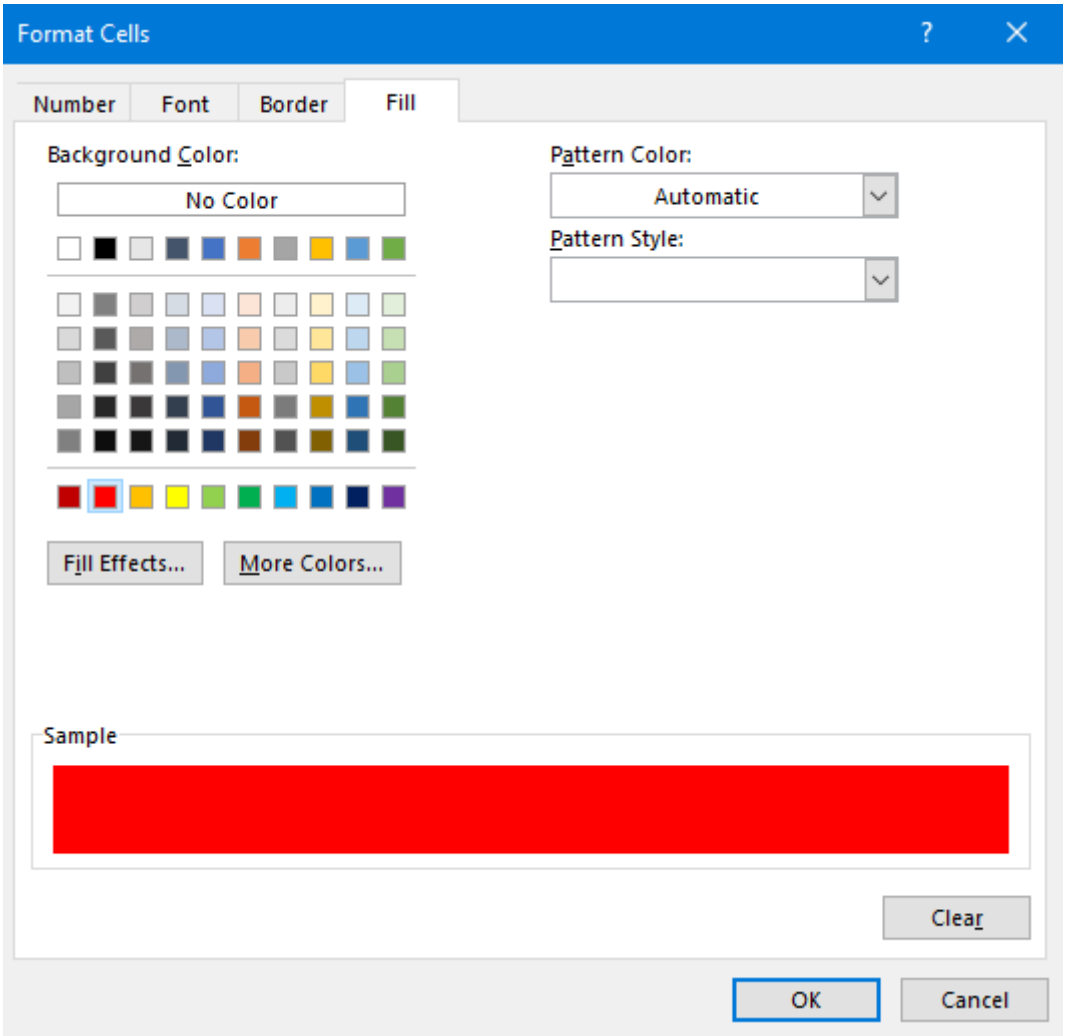


A window will appear. In the top section titled **Select a Rule Type**, choose the second option: **Format only cells that contain**.



Choose the **Cell value** (default) option for the left box, **equal to** for the middle one, and type `1` in the right box. Click **OK**.

Skipping down to the bottom right of the dialog, click **Format** ⇒ **Fill**, and choose a red color.



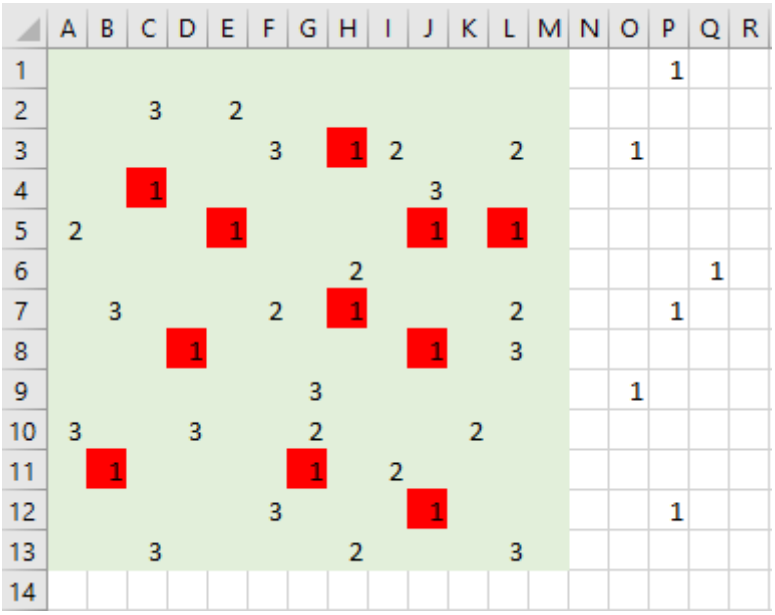
Click **OK** several times – and you are back to the spreadsheet. Nothing changed so far…

But now click on one of the cells inside the square and type "`1`" onto it.

Bingo! The cell is highlighted!

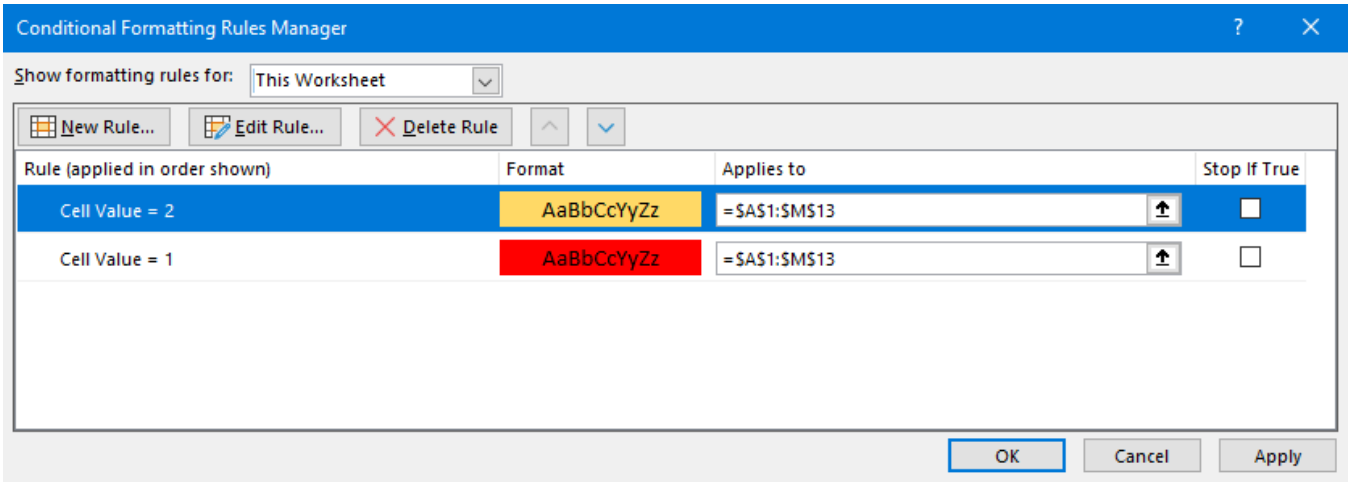
Put a few more "`1`-s" onto the square, as well as "`2`-s" and "`3`-s". Put also several "`1`-s" *outside* of the square.

Now you can see what the Conditional Formatting is about:

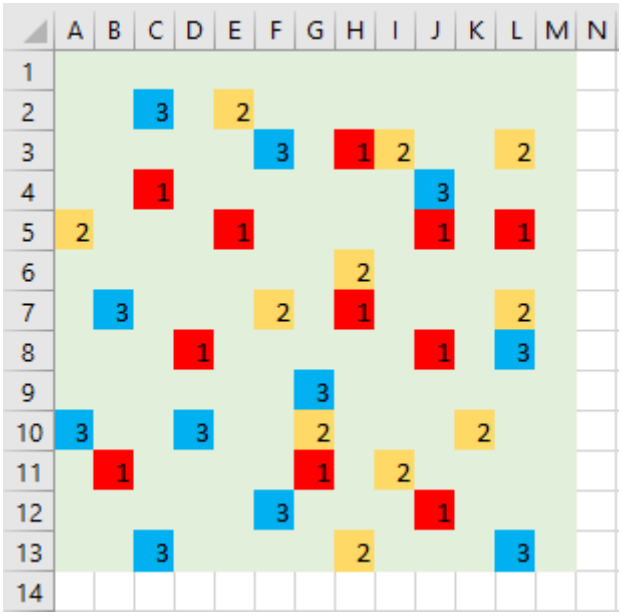


It did exactly what we asked it to do: highlighted the data – numbers in this case – that comply with a certain condition (*"equal to 1"*) in a certain area (*range A1:M13*).

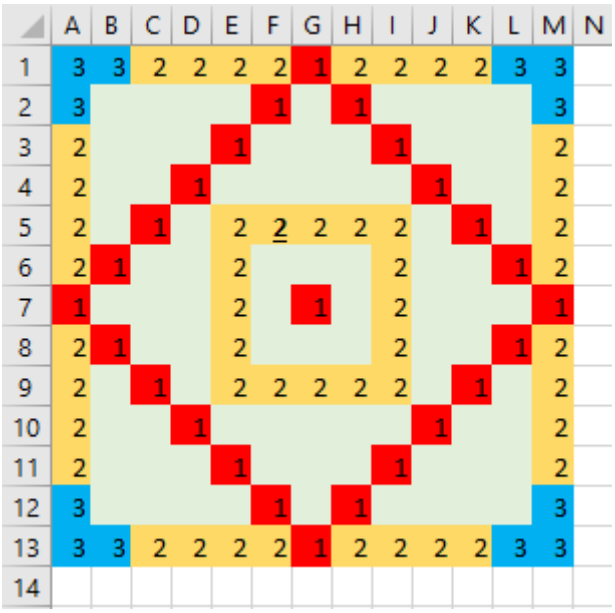
Let's add a second rule for the digit "2" – we will make it orange. Select the whole square again and go through the same steps as before. Now you have two rules operating in the same area:



Add a third rule – for "3", with blue color – on your own. Now we can easily distinguish between digits and better see their positions on the spreadsheet:

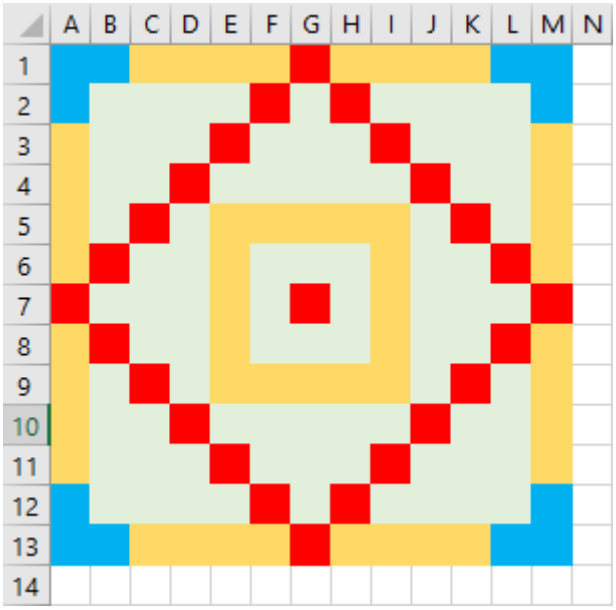


This particular pattern is not very impressive – it looks random. I can arrange my digits in a more artistic way:



I could also get rid of the numbers by formatting the font to be the same color as the fill[1]; then my picture would become even nicer!

[1]You will learn a better way to do it in the later chapters.



But typing digits manually onto the spreadsheet is both boring and inefficient. It is much more productive to use formulas to do the job, especially if the "painting area" is considerably larger than a 13x13 square (remember those big and beautiful pictures from the introduction?)

And this is exactly what we will be doing for the rest of this book: using formulas. But first let me introduce two main – and usually unseen – workers of Conditional Formatting…

Servants Behind the Scenes

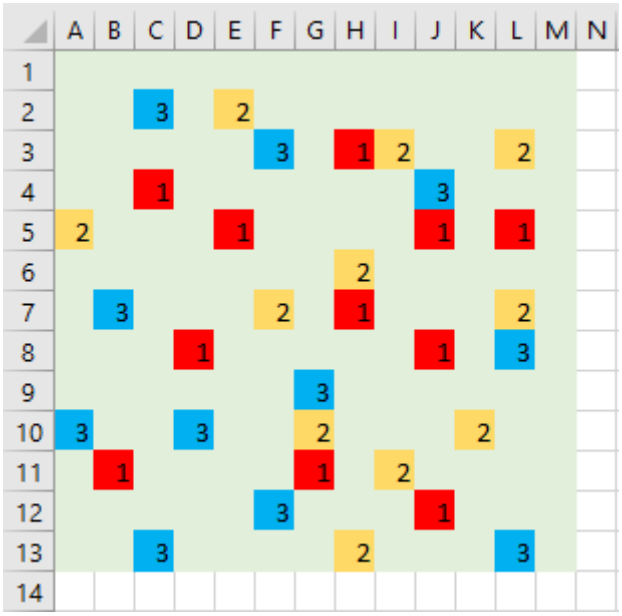
TRUE and FALSE statements

How does Conditional Formatting execute its job? The answer is: very methodically! It goes from cell to cell of the selected area, and for each cell it checks the condition. If it is met, Conditional Formatting defines the cell as `TRUE`. If not, the cell is considered `FALSE`.

Every `TRUE` cell is formatted; every `FALSE` is not.

That's it!

Take our first "picture":



The CF begins in the cell `A1`. It is not equal to `1`, so the first rule produces `FALSE`, and the cell does not become red; same with the second rule; same with the third. As a result, the cell is not formatted at all.

The same process goes for `B1`, `C1` and so on, along the first row, up till `M1`. Then the CF jumps to the second row.

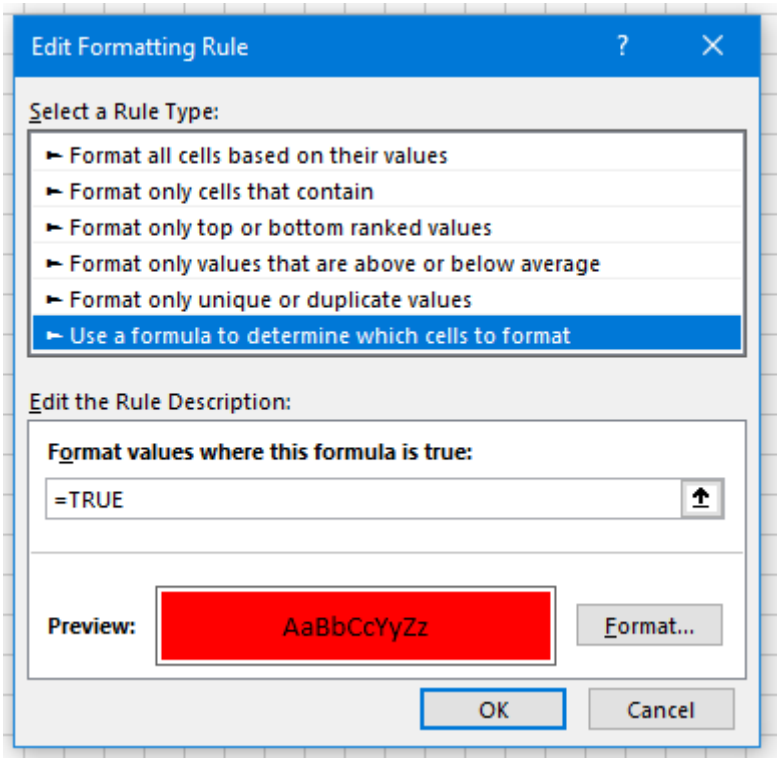
`A2` – not colored; `B2` – not colored. `C2`: the first rule gives `FALSE`, the second rule also gives `FALSE`, but the third rule gives `TRUE`, and so the cell becomes blue.

As the process continues all the way to M13, it colors some cells red, some orange, and some blue, while others are left without formatting.

We can explicitly see this `TRUE/FALSE` process by using a different CF rule.

But first we need to clear all old rules: go to **Conditional Formatting** ⇒ **Clear Rules**, and then select between clearing rules from the entire worksheet or only the selected area. Also, delete all digits from the square.

Now go to **Conditional Formatting** ⇒ **New Rule** and choose the option: **Use a formula to determine which cells to format**. Click on the textbox under the **Format values where this formula is true** and write the following expression: `=TRUE` (you can write in lowercase as well).



After several **OK**s the whole square is red. Why? Because the formula is applied to every cell, one by one, and it says explicitly `TRUE`. And every `TRUE` cell, as we know, is formatted: painted red in this case.

Let's change the rule:

1. Click on any cell *inside the square*.
2. Go to **Conditional Formatting** ⇒ **Manage Rules**.
3. Click on **Edit Rule**.
4. Instead of `=TRUE` write the expression: `=FALSE`; click **OK**.
5. **Apply**; **OK**.

The square is light green again.

For our future projects it is important to know that in Conditional Formatting `FALSE` is equivalent to `0`, while `TRUE` - to any number except `0`. You can check it for yourself, by going to **Edit Rule** window and

replacing the formula `=TRUE` with `=1` or `=5` or `=2*4+7` and almost anything else. Formula `=FALSE` can be replaced with `=0` or any mathematical expression that evaluates to `0`: for example, `=(6/3)-2` and the like.[2]

[2]You will find more details about `TRUE` and `FALSE` equivalents in Appendix 1.

This is the end of the sample book

To continue reading, please purchase the book at https://leanpub.com/spreadsheetadventures

You may be pleased to learn that 100% of your purchase amount gets donated to charity:

> For every book sold, my son Michael will donate half the purchase amount to charity. His employer, Microsoft, will then match the donation dollar-for-dollar. This means that 100% of what you pay for the book will go to charities that support humanitarian & environmental causes. You get a book, and a charity gets the exact amount you paid for the book, for a total of up to $20,000 per year. It's a win-win!

Happy reading!

– Alexander

The First Brush Stroke

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Painting with a Bigger Brush

This content is not available in the sample book. The book can be purchased on Leanpub at http://leanpub.com/spreadsheetadventures.

Still Wider Brush

This content is not available in the sample book. The book can be purchased on Leanpub at http://leanpub.com/spreadsheetadventures.

More Sophisticated Strokes

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PART II: ANIMATION

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APPENDIX 1: DEEP DIVES INTO SIDE TOPICS

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What's True or False?

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Relative and Absolute References

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Numbers in Hiding

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