Make a picture come to life with Excel

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You will need to open Excel and notepad (Windows) or TextEdit (Macs).
You'll need the data on this page https://**bit**.ly/**arecibo**commas
and to download file *07 - Emoji* from this page https://**bit**.ly/arecibo**data**files

The plan

First you'll create a text file with lots of ones and zeroes (1s and 0s) in it; each is separated by a comma. This is known as a Comma Separated Variable (or Value) file, or "CSV". Files like this usually have the .csv or .txt ending ('suffix'). Then you'll import it into Excel and change the 1s and 0s for coloured squares so that you can see more clearly a picture hidden in the 1s and 0s.

If you import the file into Excel you will need to tell it how to handle the commas so that each value is parsed (split) into a single column. Each row of this CSV file has 23 variables with 22 commas between each (there's no comma at the end (but there is an invisible 'new line' paragraph marker which instructs Excel to move to the next line).

The instructions

If you make a mistake you can use Ctrl+Z (⌘+Z on a Mac) to undo (or Ctrl+Y / ⌘+Y to redo).

A. Creating the text file

1. Open a blank text file
On a Windows computer this is *notepad.exe* on a Mac computer this is TextEdit

2. Open this web page
https://**bit**.ly/**arecibo**commas
You'll see lots of numbers that look like this →

Carefully position your mouse cursor at the top left of the first digit (0) and drag all the way to the bottom of the page, selecting *only* the numbers and commas. Use Ctrl+C (⌘C on a Mac) to copy the text.

0,0,0,0,0,0,1,0,1,0,1,0,1,0,0,0,0,0,0,0,0,0,0
0,0,1,0,1,0,0,0,0,0,1,0,1,0,0,0,0,0,0,0,1,0,0
1,0,0,0,1,0,0,0,1,0,0,0,1,0,0,1,0,1,1,0,0,1,0
1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,1,0,0,1,0,0
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
0,0,0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0,0,0,0,0
0,0,0,0,0,0,0,0,0,0,1,1,0,1,0,0,0,0,0,0,0,0,0

3. Put the cursor into your blank text file and press Ctrl+V (V for Macs) to paste the text in. Save the file as **arecibocommas** and make a

```
0,0,0,0,0,0,1,0,1,0,1,0,1,0,0,0,0,0,0,0,0,0,0
0,0,1,0,1,0,0,0,0,0,1,0,1,0,0,0,0,0,0,0,1,0,0
1,0,0,0,1,0,0,0,1,0,0,0,1,0,0,1,0,1,1,0,0,1,0
```

note of where you saved it (its 'file path'). It should look like this ↑ with the digits lined up in columns.

If you scroll down your newly created text file you might see the faint shape of a pattern - we're going to use Excel to make the image clearer.

B. Importing the text file into Excel

4. Open a blank Excel document (Excel sheet). Click on the **File** menu and then **Import**. It will ask you what type of file you want to import, choose the **.csv** option.

5. You'll then see a window pop up which will let you navigate to where your target file (**arecibocommas**) is, do that and select the file, then click the 'Get Data' button.

6. Excel will correctly spot that your data is 'delimited' (has fixed boundaries, separated in this case by commas). Click the blue **Next** button then choose **Comma** from the options (and de-select **Tab**). You'll see the data move into columns, press **Next** again.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
2	0	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0
3	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	1	1	0	0	1	0
4	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0	0	1	0	0	1	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0

7. Keep the text as the default 'General' option and press Finish. You will now be asked where you want the data to go, choose 'Existing sheet' and press OK.

8. You should now see something like the image (left), with each 1 or 0 in a separate cell by itself. There are 73 rows and 23 columns. Scroll down to see the image (though it might not be very clear yet).

C. Bringing out the image
You're going to turn all the 1s into solid black squares and all the 0s into solid white squares. We'll use the *Advanced Find and Replace* function for this.

9. Open this webpage: https://**bit**.ly/arecibo**data**files
Save (download) then open the file called "*07 – Emoji black and white squares for Arecibo worksheets*" - it contains example emoji which you can use for this worksheet.

10. From the *07 - Emoji* file select a white square emoji ☐ by positioning your cursor on either side, clicking and dragging over the emoji and releasing (to highlight your chosen emoji). Click Ctrl+C (⌘C) to copy it.

11. In Excel click **Edit** » *hover over* **Find** and then click on **Replace**. An options box will appear. Type 0 into the *Find* box. Put your cursor into the '*Replace with:*' box and click Ctrl+V (⌘V) to paste the white emoji square in. Click *Replace all* and it will swap all the 0s for white squares and tells you how many changes it's made.

12. Do the same for all the 1s. Select and highlight a black square ■ from file *07 - Emoji*, copy it and then paste it into the *Replace with:* box. Type 1 into the *Find* box and then Replace all.

You should now have something that looks more like the image above.

This is a version of the *Arecibo Message* which was sent on 16th November 1974 into space by the radio telescope at the Arecibo Observatory in Puerto Rico. It's a pictogram, transmitted by binary, which contains information about humans on planet Earth. The image contains information about our Solar System, our DNA and the most abundant chemicals on the Earth. You can find out more about the message from our Arecibo info sheet at https://**cs4fn**.blog/**arecibo**