Social Sciences
Home Learning Pack
Year 7

✓ Computer Science

Hour of Code @ WSO

From Decimal to Binary

What's binary? It's the language used by computers. It's made up of 1s and 0s.

Decimal to Binary Conversion – let's learn how to do this!

To convert decimal between 0 and 255 into binary, follow these steps.

Consider this table:

128	64	32	16	8	4	2	1

Starting from the right hand side, you add a '1' underneath the number above if it can be taken away from the decimal number you are dealing with (and leave a number 0 or above.)

e.g. We want to convert 180 into binary. 180 can have 128 taken away so we would add a '1' under 128.

Now calculate what you have left. In our example

180 – 128 = 52

Move along to the next number in the table: 64. Can this be taken away from the decimal number we have remaining? i.e. can 64 be taken away from 52? No. So add a '0' underneath 64.

Move along to the next number in the table: 32. Can this be taken away from the decimal number we have i.e. can 32 be taken away from 52? Yes. So add a '1' underneath 32.

Now calculate what you have left.

52 – 32 = 20

Keep going.

You'll end up with:

128	64	32	16	8	4	2	1
1	0	1	1	0	1	0	0

You are left with an 8-bit binary number: **10110100**

FACT ONE: 1 bit is each digit. This is the smallest amount of data a computer understands.

FACT TWO: 8 bits = 1 byte

THAT'S IT!

Now have a go at converting the decimal numbers on the next page.

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Convert the following decimal numbers to 8-bit binary:

1. 21

128	64	32	16	8	4	2	1

2. 66

128	64	32	16	8	4	2	1

3. 178

128	64	32	16	8	4	2	1

4. 3

128	64	32	16	8	4	2	1

5. 35

128	64	32	16	8	4	2	1

6. 222

128	64	32	16	8	4	2	1

7. 196

128	64	32	16	8	4	2	1

8. 255

128	64	32	16	8	4	2	1

Completed? You get a house point! Ask your tutor / teacher.

Computer Science activities you can do at home: https://code.org/learn; https://www.codecademy.com; https://www.kodugamelab.com/; https://www.tynker.com/

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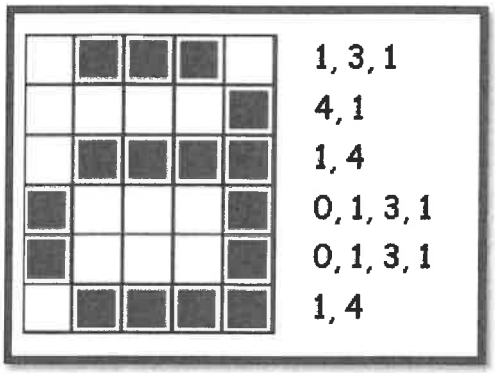
Image representation

What's the point of this task? You will gain an understanding of how images are stored in a computer.

Introduction: Computers store drawings, photographs and other pictures using only numbers. Computer screens are divided up into a grid of small dots called pixels (**pic**ture **el**ements). In a black and white picture, each pixel is either black or white.



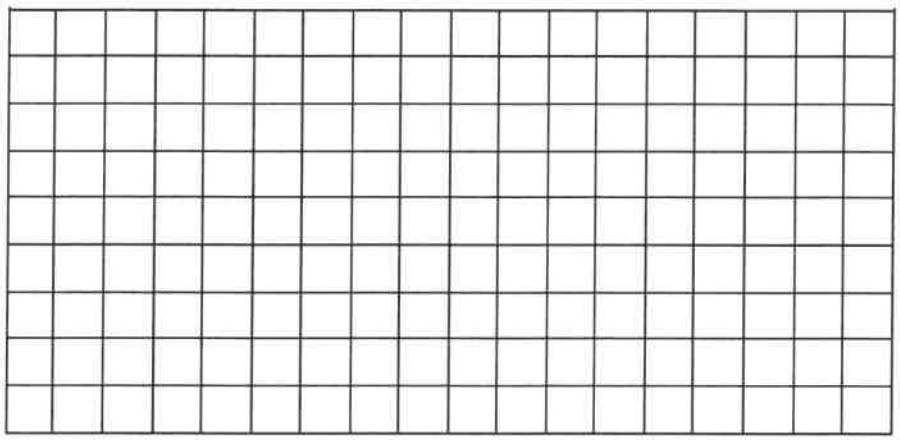
When a computer stores a picture, all that it needs to store is which dots are black and which are white.

This picture can be represented by numbers. The first line consists of one white pixel, then three black, then one white. The first line is represented as 1, 3, 1.

The **first number always relates to the number of white pixels. If the first pixel is black, the line will begin with a zero.**

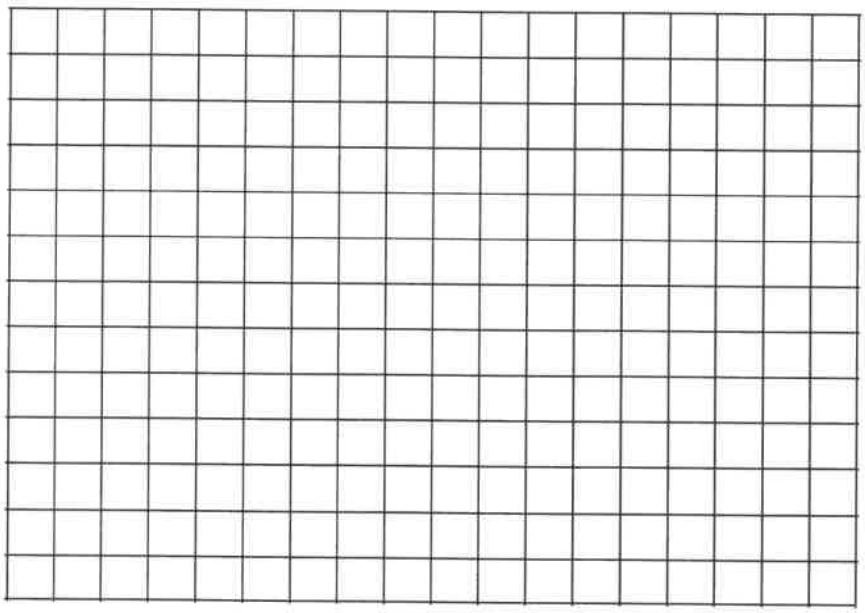
Look at the number representations below. Read each line and create the picture in the grids.

PICTURE 1



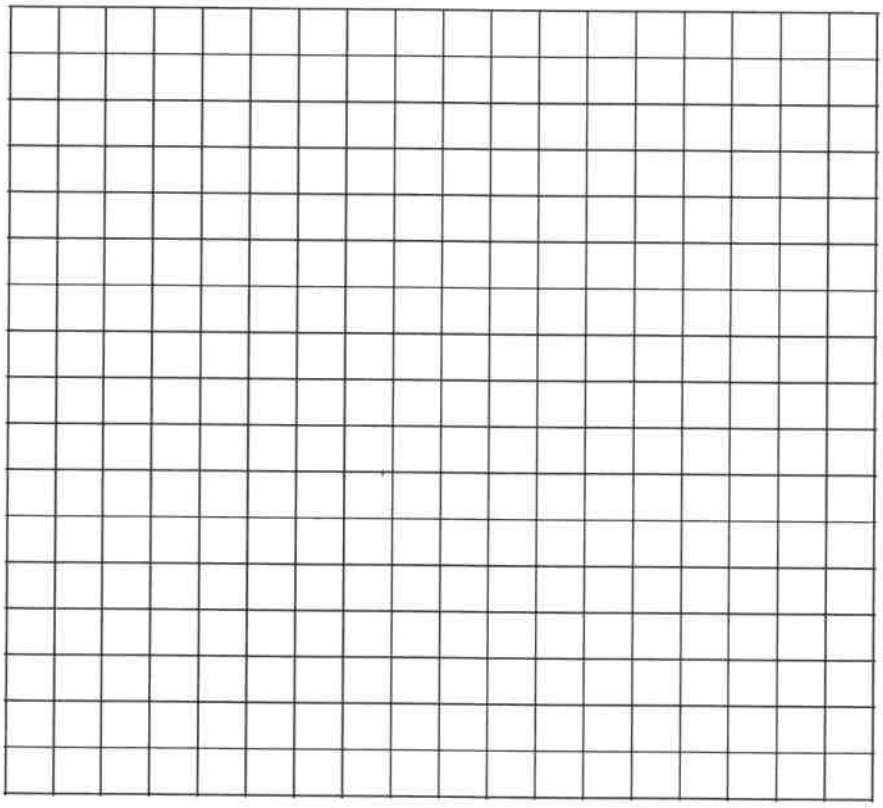
4, 11
4, 9, 2, 1
4, 9, 2, 1
4, 11
4, 9
4, 9
5, 7
0, 17
1, 15

PICTURE 2



6, 5, 2, 3
4, 2, 5, 2, 3, 1
3, 1, 9, 1, 2, 1
3, 1, 9, 1, 1, 1
2, 1, 11, 1
2, 1, 10, 2
2, 1, 9, 1, 1, 1
2, 1, 8, 1, 2, 1
2, 1, 7, 1, 3, 1
1, 1, 1, 1, 4, 2, 3, 1
0, 1, 2, 1, 2, 2, 5, 1
0, 1, 3, 2, 5, 2
1, 3, 2, 5

PICTURE 3



6, 2, 2, 2
5, 1, 2, 2, 2, 1
6, 6
4, 2, 6, 2
3, 1, 10, 1
2, 1, 12, 1
2, 1, 3, 1, 4, 1, 3, 1
1, 2, 12, 2
0, 1, 16, 1
0, 1, 6, 1, 2, 1, 6, 1
0, 1, 7, 2, 7, 1
1, 1, 14, 1
2, 1, 12, 1
2, 1, 5, 2, 5, 1
3, 1, 10, 1
4, 2, 6, 2
6, 6

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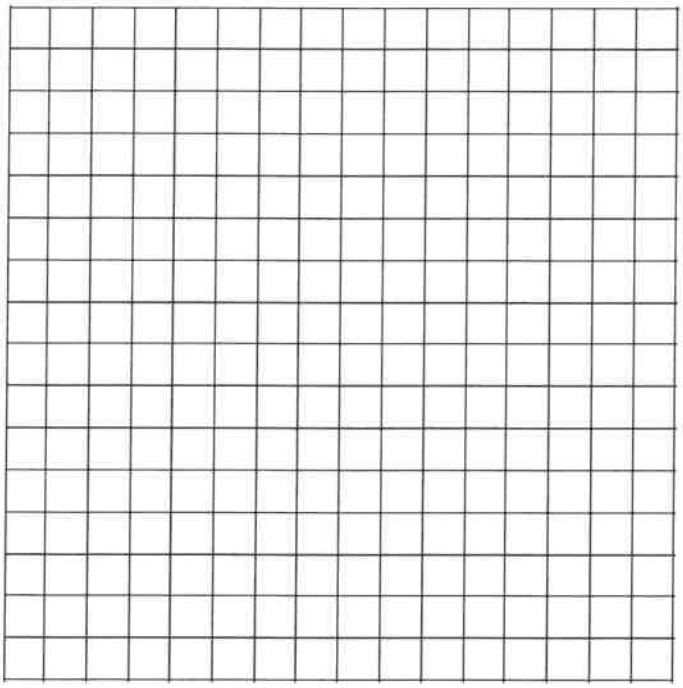
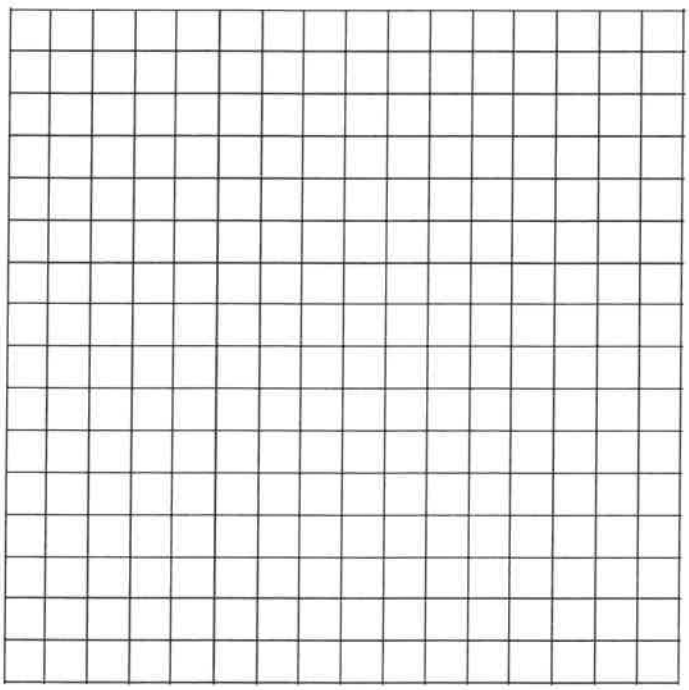
Create your own!

Why not try making your own coded picture for a peer? Draw you picture on the top grid, and when you've finished, write the code numbers beside the picture on the bottom grid. Cut along the dotted line and give the bottom grid to a peer to colour in.





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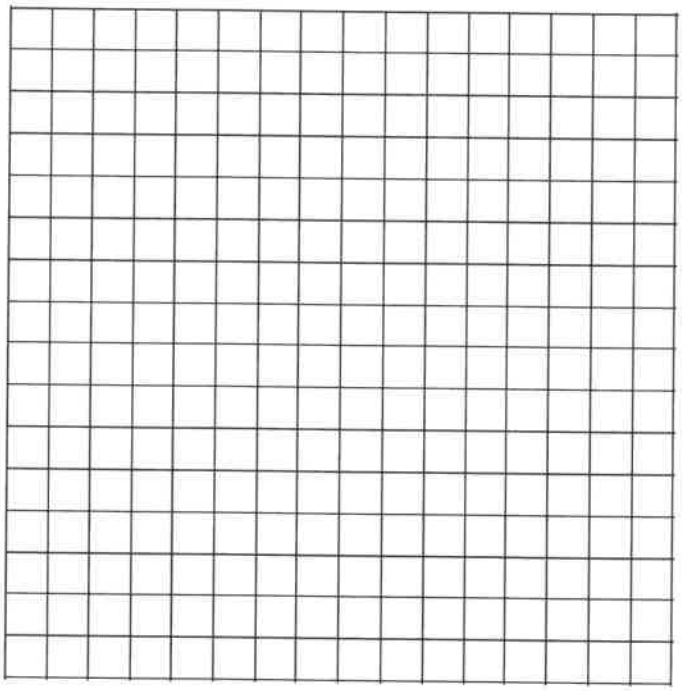
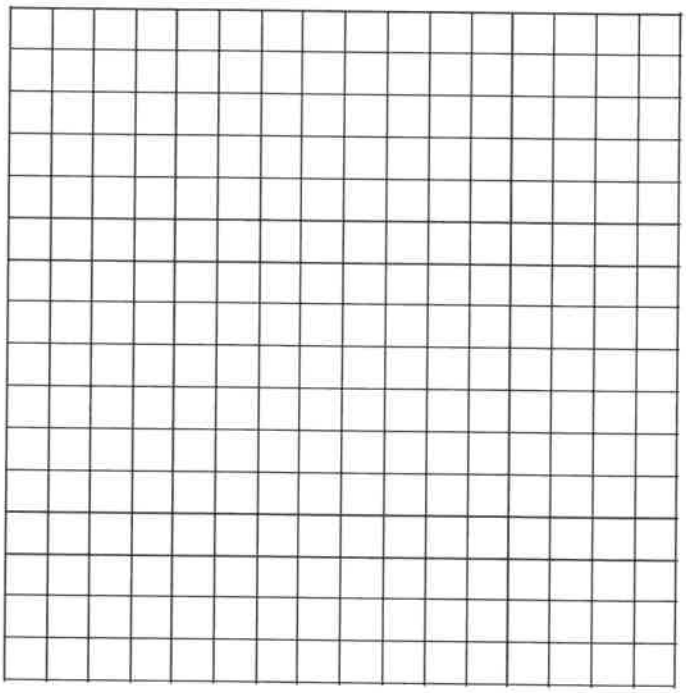
Spare





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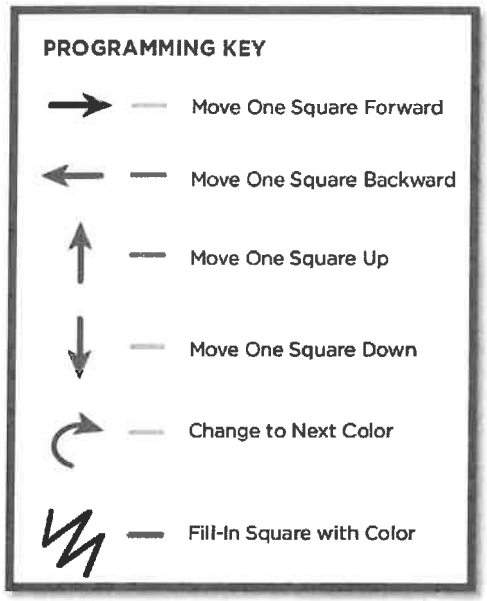
Drawing algorithm

What is an algorithm? A series of instructions to complete a task.

What's the point of this task? You will create a drawing algorithm for your peer so they can draw the intended picture. You will understand that instructions need to be very clear and that just because it's clear to you, doesn't mean it's clear to the drawer.



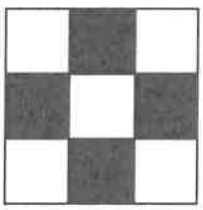
The key on the left is what you'll use to create the algorithm.

For example:

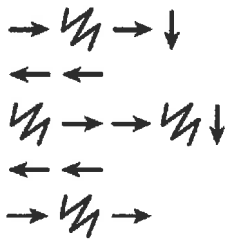
"Move one square forward, Move one square forward, Fill-in square with color"

would be communicated as:

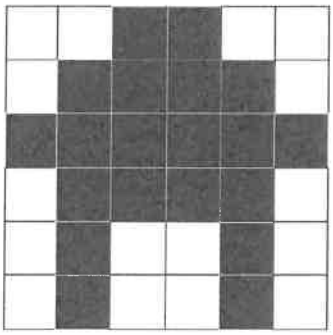
A full example is given below of an image to draw, the plain-English algorithm, and the algorithm in symbols.



**"step forward, fill-in, step forward, next row,
back, back,
fill-in, step forward, step forward, fill-in, next row,
back, back,
step forward, fill-in, step forward"**



Your turn!



Write the algorithm in symbols for this drawing independently or working in a pair.

Now think about making the code a little shorter. What could you replace "back, back, back, back, back" with?

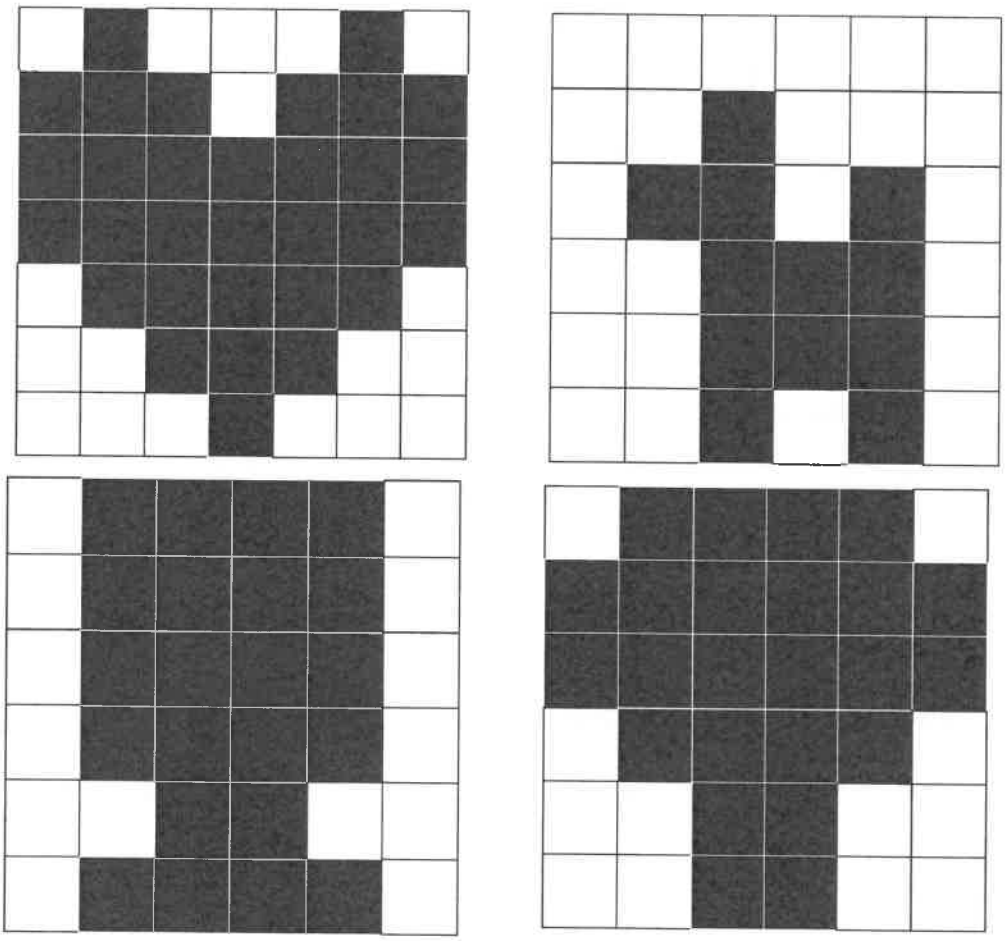
Possibly ← 6

You can use steps like these to make the algorithm shorter so it's easier to read and also takes up less space.

Re-write the algorithm you wrote for the above image to show

Keep going!

Now write an algorithm in symbols to get your pair to draw **exactly** the images below:



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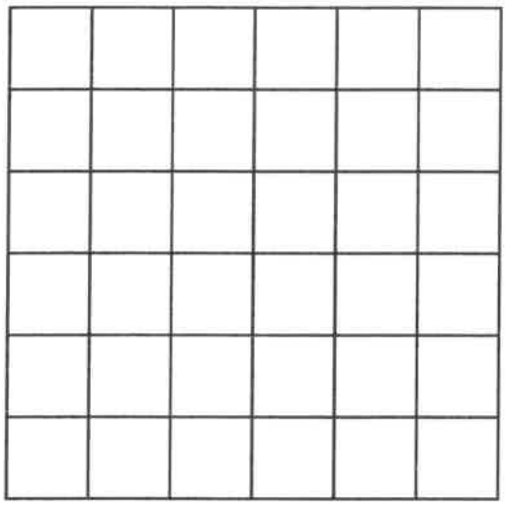
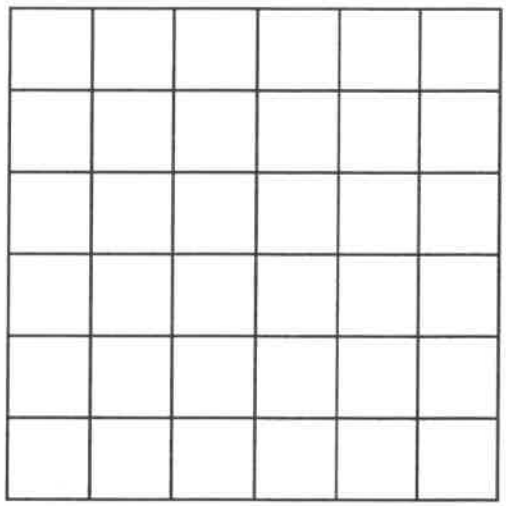
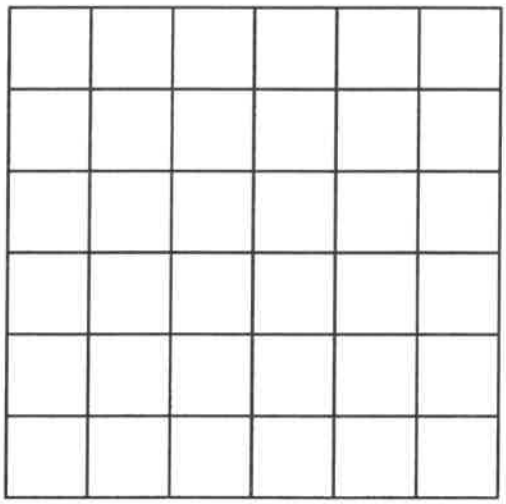
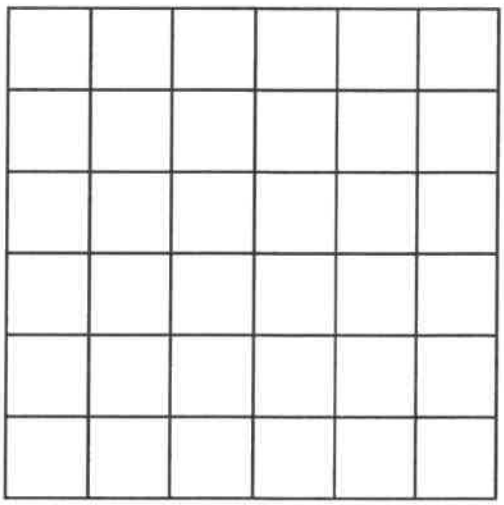
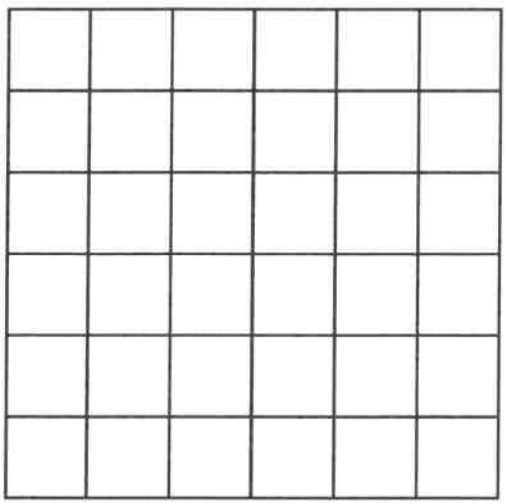
Make your own! Use the grids below or use MS Excel – make sure you resize the columns to create squares.

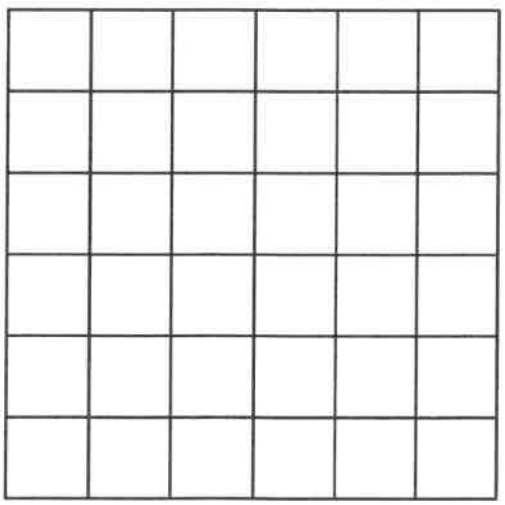












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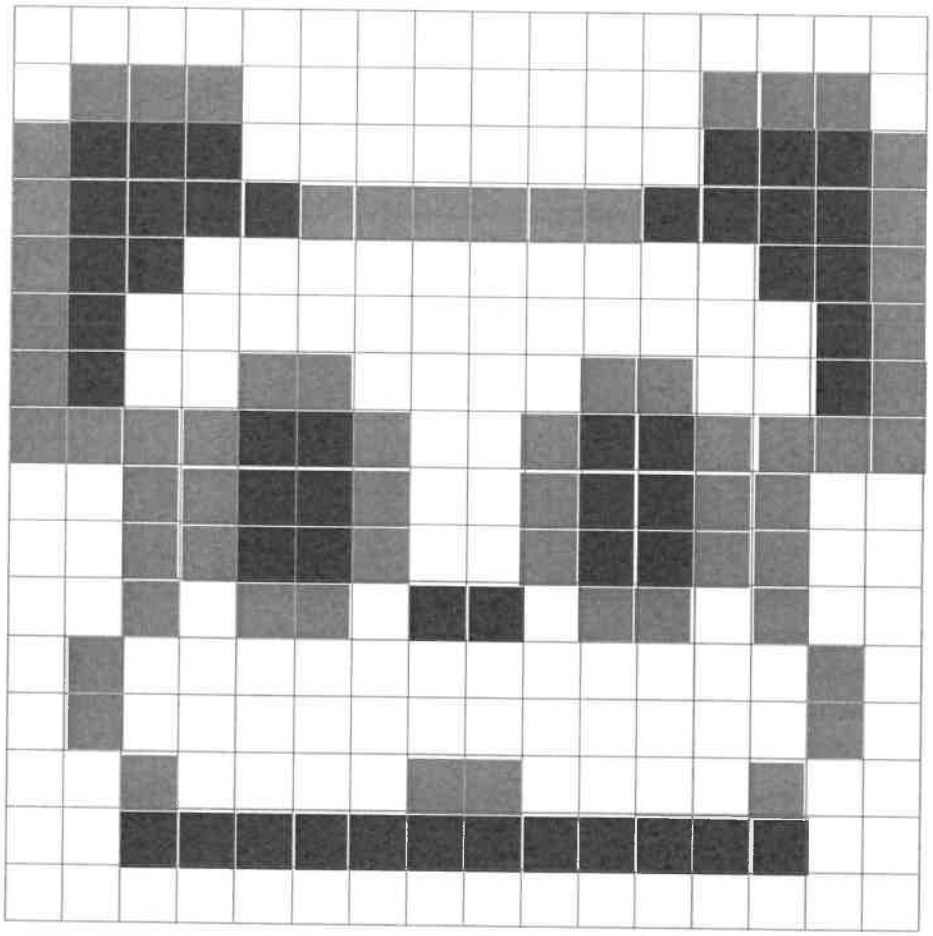
How about adding a different colour?

Color 1

Color 2



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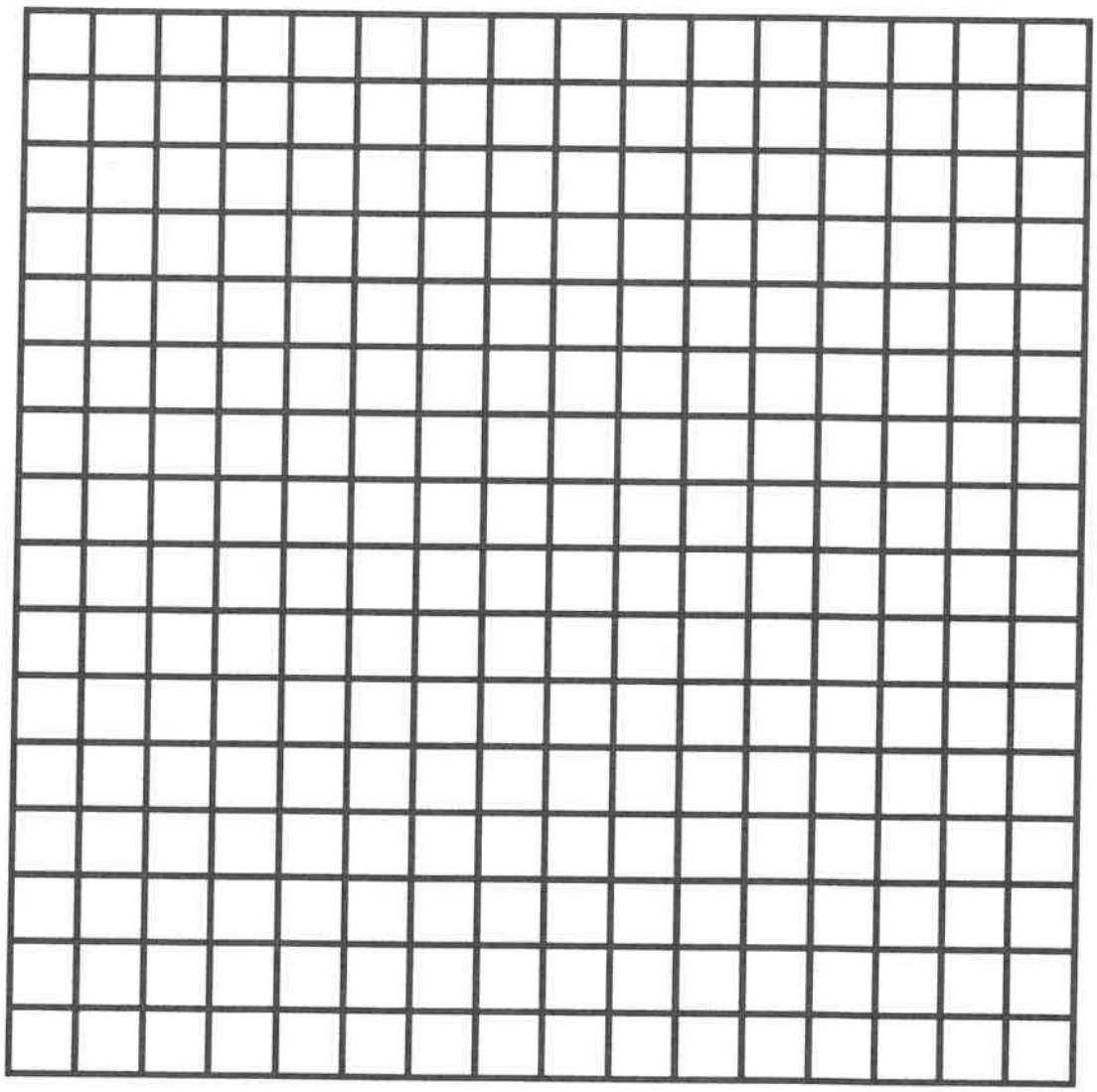

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