Pixel art

Overview

This activity fulfills **Stage 2, Requirement 1** of the **Digital Maker Staged Activity Badge** (Create a piece of interactive or animated digital art using software). It shows young people to create and code their own pixel art on paper to teach them how computers represent and display images.

20–30 minutes
(up to 60 minutes for younger groups)

Flexible

Gather materials and print resources

Flexible

You will need:

- Large pieces of square paper and a pen to draw grids of at least 10×10 with your group (alternatively, print out the template from the end of this document)

- Printed resources (one pixel art handout per young person, one pixel art answer sheet per group)

- Markers, crayons, or pencils to colour in the grids

Key messages

- A computer represents pictures through numbers.

- Computer screens are made up of a grid of tiny squares called **pixels** (picture elements). Each square on the grid represents one pixel.

- Everything you see on a computer screen uses many different coloured pixels.

- A pixel can be represented by its coordinates on the grid.

- Pixel coordinates on the grid start from (0,0) in the top left-hand corner. The grid's x-axis goes from left to right, and its y-axis goes from top to bottom.

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Adaptability

○ Use colours to fill in the grids, instead of black and white (see examples below). When coding or decoding, young people can use the numbers as in the handout, then add in a new code to represent the colour (e.g. '4 blue, 5 red' or '4 b, 5 r'). If you're using colours, you could get young people to figure out a method for coding colours themselves.

○ Get young people to draw simple shapes first (eg triangles, squares, rectangles) to get used to the concept. Once they are more confident, they can draw more complex shapes (e.g. insects, trees).

○ To save time, decode only one image in Step 4, and have young people draw fewer images in Step 5.

○ As an extra challenge, can young people code the first letter of their name? Can they code a whole word?

○ As an extra challenge, can young people figure out how to animate the bug in the example? Can they draw a sequence of pictures that can be animated?

○ Using colours:

   • For Step 5, get the young people to use colours when drawing their own images.

   • For Step 6, get young people to come up with their own method of coding their colours.

   • To challenge your group, ask them to draw a scene using their colours.

Alternatives

○ You could draw grids on the ground outside using natural materials or biodegradable chalks.

○ You could use larger grids to allow for more flexibility.

Instructions
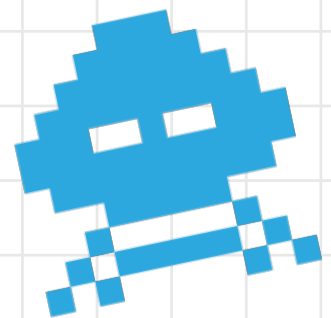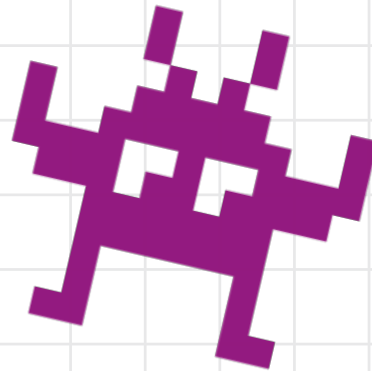
1 Discuss where you see images on computers. Describe what you see.

2 Computer screens are divided up into a grid of very small dots called **pixels** (picture elements). In a black and white picture, each pixel is either black or white. In a colour picture, each pixel is a single colour. These images show how pixels make images.

(1,0) (2,0) (3,0)

(4,1)

(1,2) (2,2) (3,2) (4,2)

(0,3) (4,3)

(0,4) (4,4)

(1,5) (2,5) (3,5) (4,5)
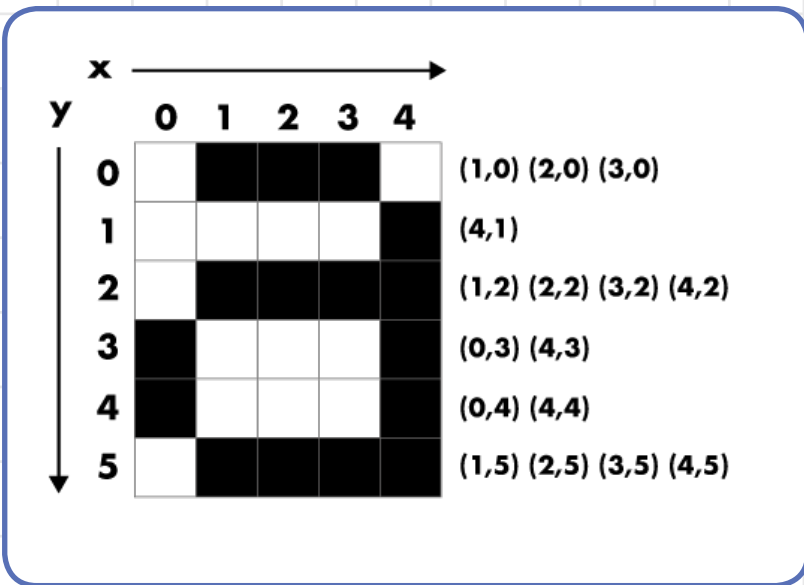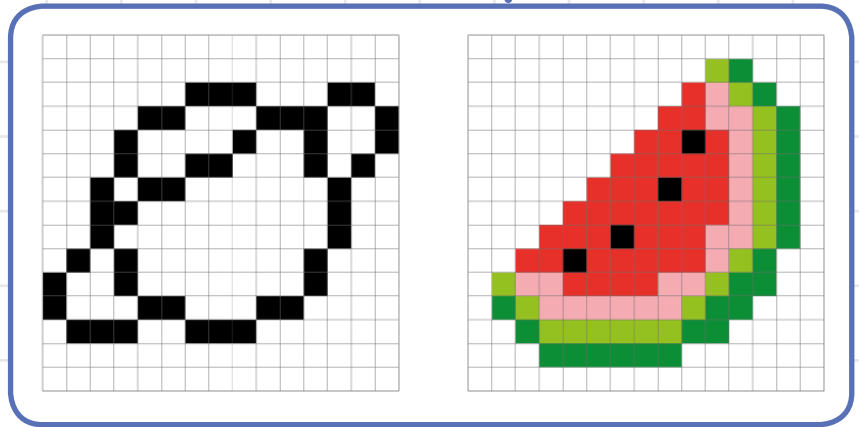
3 Computers represent everything, even pictures, through numbers. This means that when you design a picture for the computer, you need to make sure you have represented the picture in numbers. In this picture, for example, you can see how each square on the grid corresponds to a coordinate for each row (starting with 0).

Computers code images by reading the coordinates of coloured pixels. For computers, the grid numbering starts from (0,0) at the **top left-hand corner** of the grid (the opposite to maps!). This is because computers use the same coordinates as old-fashioned televisions, which display images in horizontal lines from left to right and top to bottom.

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4 Decode these images by colouring in the right coordinates. You can use whichever colour you like. What images do you see?
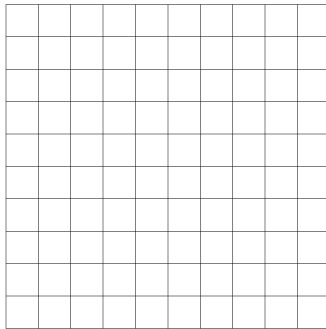
(1,1) (2,1) (6,1) (7,1)
(0,2) (3,2) (5,2) (8,2)
(0,3) (4,3) (8,3)
(0,4) (8,4)
(1,5) (7,5)
(2,6) (6,6)
(3,7) (5,7)
(4,8)
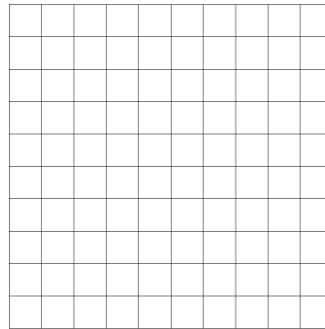
(3,0) (6,0)
(0,1) (4,1) (5,1) (9,1)
(0,2) (1,2) (2,2) (3,2) (6,2) (7,2) (8,2) (9,2)
(2,3) (7,3)
(0,4) (2,4) (7,4) (9,4)
(0,5) (1,5) (2,5) (7,5) (8,5) (9,5)
(2,6) (7,6)
(0,7) (1,7) (2,7) (7,7) (8,7) (9,7)
(0,8) (3,8) (6,8) (9,8)
(4,9) (5,9)

5 Create three of your own pixel art images. Can you create any outdoor-themed images? For example, you could try to draw a bee, a fly, a caterpillar, a leaf, a tree, campfire, a boat, a mountain, a tent, a cat, a mouse, a frog, or some flowers?

6 Using a separate piece of grid paper, code your images by writing down the coordinates for each. This paper should only have your coordinates written on it. It should not include the image itself.

7 Find a partner and swap coordinates. Ask your partner to decode your images without looking at the images first. Do they match?
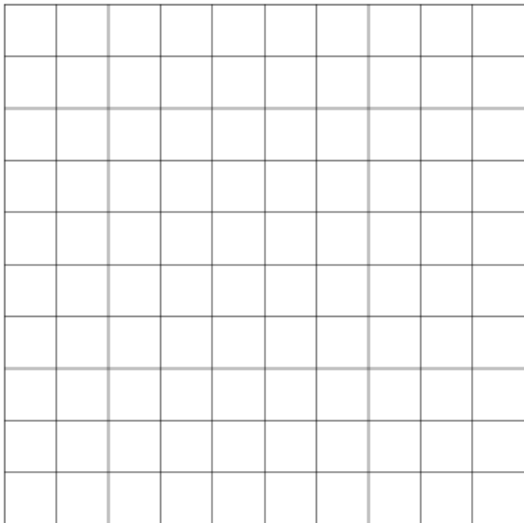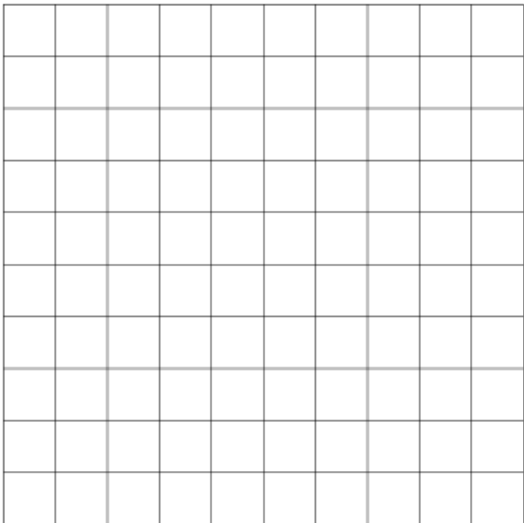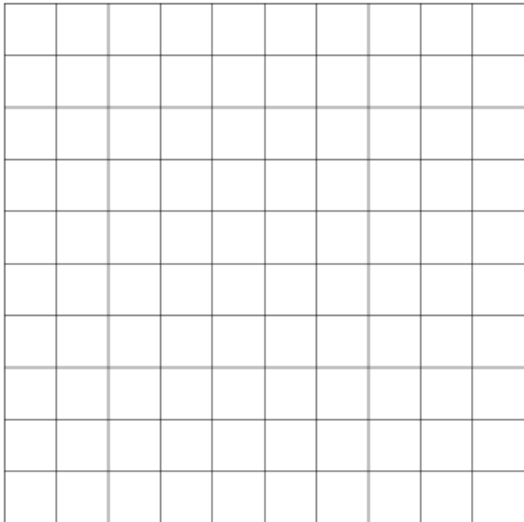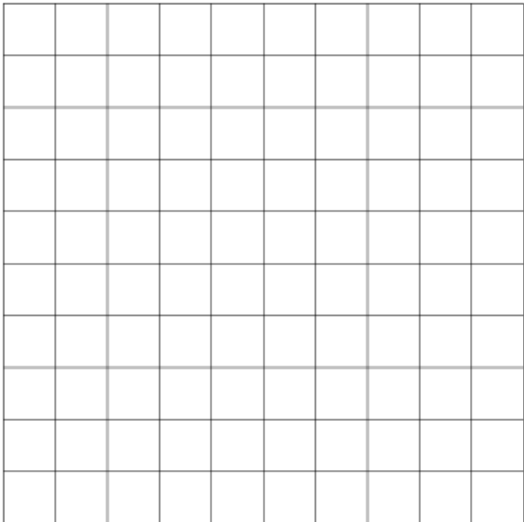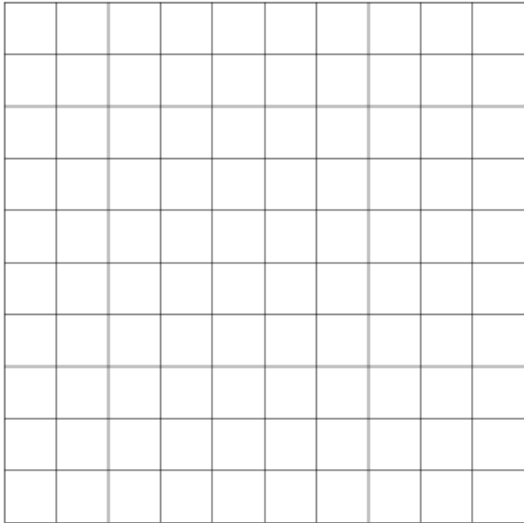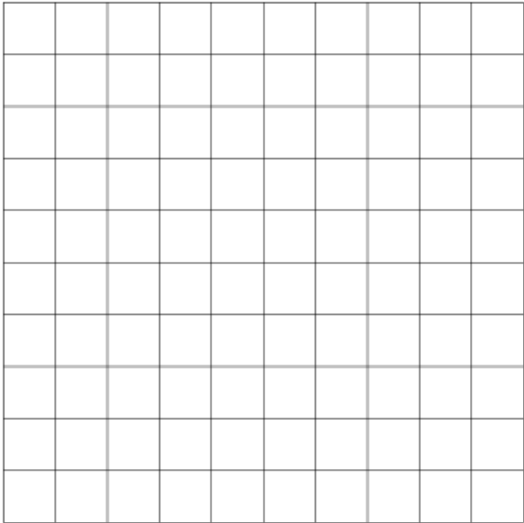
Trivia

Did you know that the most common computer screen size that people use (1366×768 resolution) contains 1,049,088 pixels? That's 10491 copies of the pixel grid (10×10) you're using here, scrunched into one single computer screen!
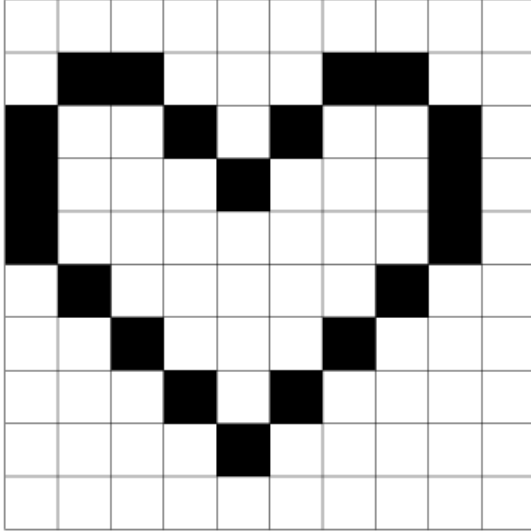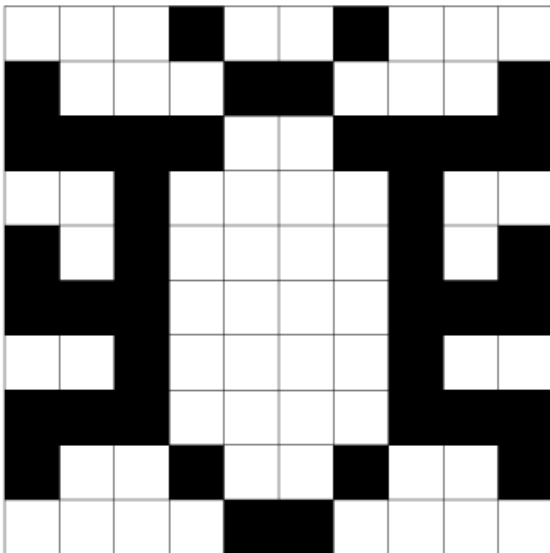
Tip

The grid starts at 0.

Grids

Pixel art answer sheet

(1,1) (2,1) (6,1) (7,1)
(0,2) (3,2) (5,2) (8,2)
(0,3) (4,3) (8,3)
(0,4) (8,4)
(1,5) (7,5)
(2,6) (6,6)
(3,7) (5,7)
(4,8)

(3,0) (6,0)
(0,1) (4,1) (5,1) (9,1)
(0,2) (1,2) (2,2) (3,2) (6,2) (7,2) (8,2) (9,2)
(2,3) (7,3)
(0,4) (2,4) (7,4) (9,4)
(0,5) (1,5) (2,5) (7,5) (8,5) (9,5)
(2,6) (7,6)
(0,7) (1,7) (2,7) (7,7) (8,7) (9,7)
(0,8) (3,8) (6,8) (9,8)
(4,9) (5,9)