THE JCB ACADEMY

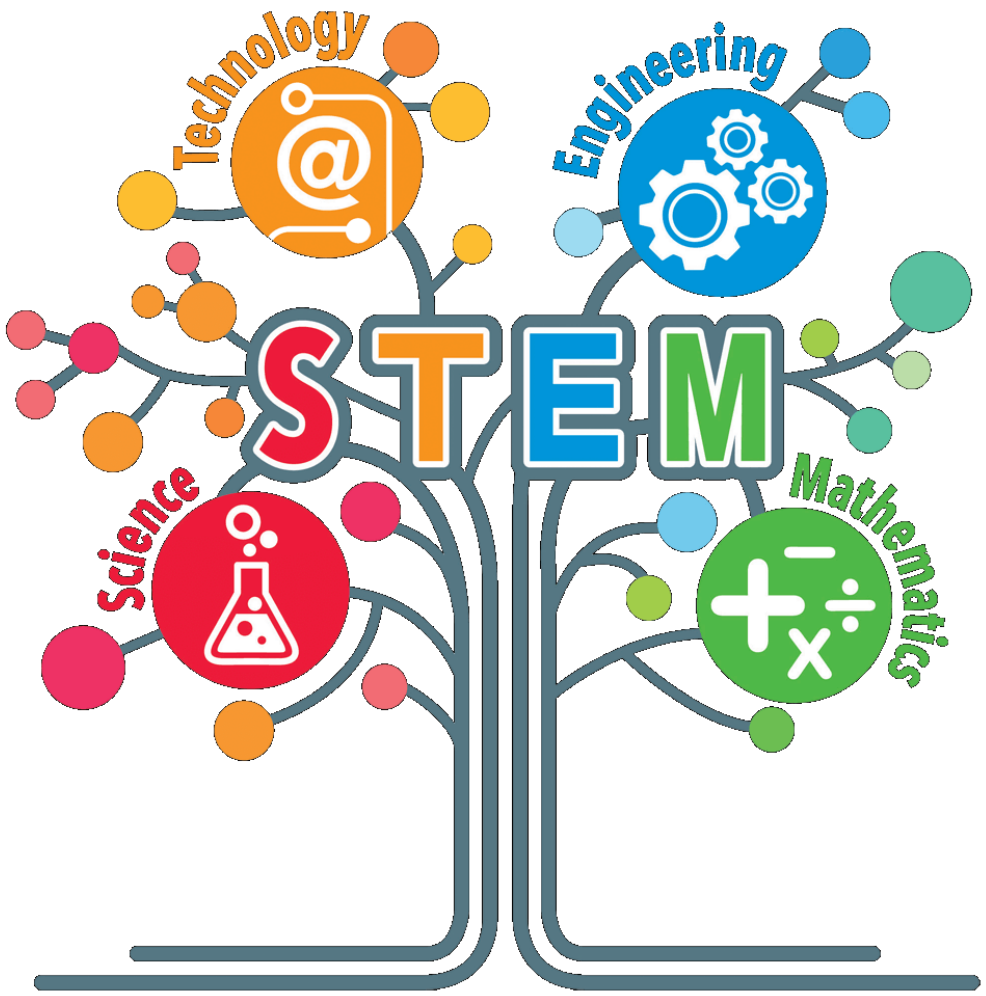
STEM Challenges

What's it like at the JCB Academy?

https://jcb-academy.com/

STEM Challenge

What is STEM?



STEM stands for -

Science

Technology

Engineering

Mathematics

These subjects are linked directly to each other and this task will highlight your skills in each of these subject areas.

Objectives To understand what is meant by STEM. To demonstrate the effect of friction

Colour by Numbers—*Image Representation*

Summary

Computers store drawings, photographs and other pictures using only numbers. The following activity demonstrates how they can do this.

Curriculum Links

Mathematics: Geometry Level 2 and up. Exploring Shape and Space.

Skills

Counting

Graphing

Ages

7 and up

Materials

Image representation worksheet

pencils

Introduction

Discussion Questions

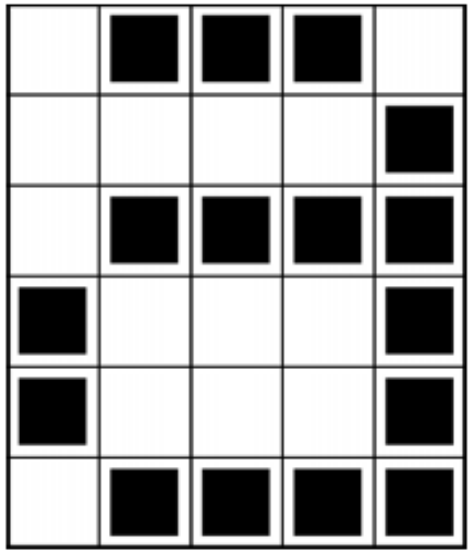
1. In what situations would computers need to store pictures? (A drawing program, a game with graphics, or a multi-media system.)
2. How can computers store pictures when they can only use numbers?

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.

The letter “a” has been magnified above to show the pixels. When a computer stores a picture, all that it needs to store is which dots are black and which are white.

Introduction



1, 3, 1

4, 1

1, 4

0, 1, 3, 1

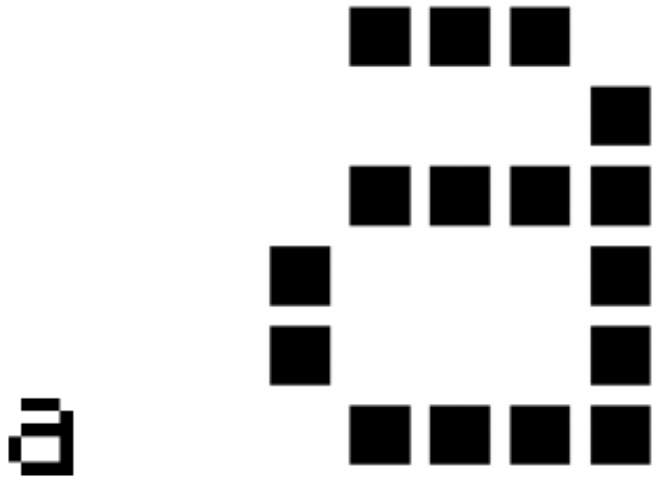
0, 1, 3, 1

1, 4

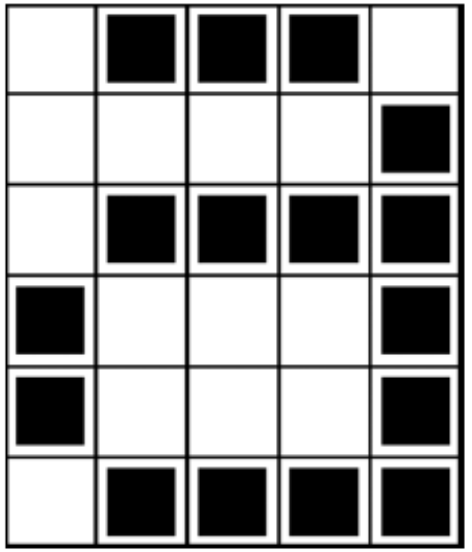
The picture on the side shows us how a picture can be represented by numbers. The first line consists of one white pixel, then three black, then one white. Thus the first line is represented as 1, 3, 1.

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

The worksheet on page 17 gives some pictures that the children can decode using the method just demonstrated.



▲ A letter "a" from a computer screen and a magnified view showing the pixels that make up the image



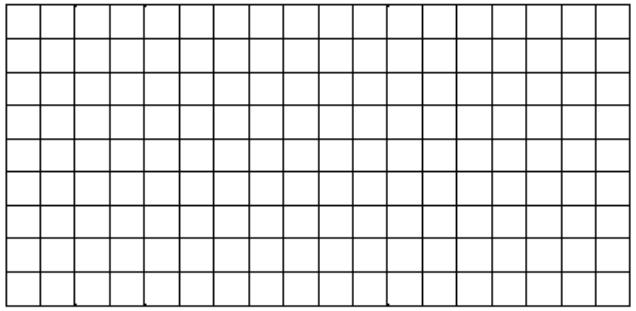
1, 3, 1
4, 1
1, 4
0, 1, 3, 1
0, 1, 3, 1
1, 4

Worksheet

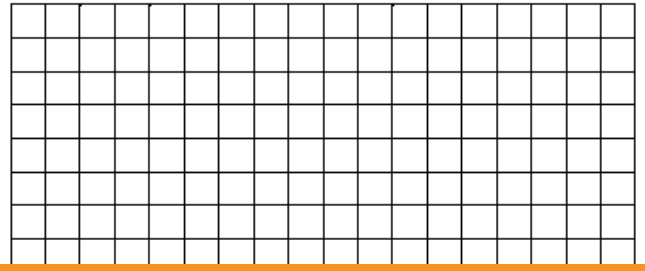
Complete the attached worksheet titled “image representation worksheet”.

Worksheet Activity

The first picture is the easiest and the last one is the most complex. It is easy to make mistakes and therefore a good idea to use a pencil to colour with and have a rubber handy!



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

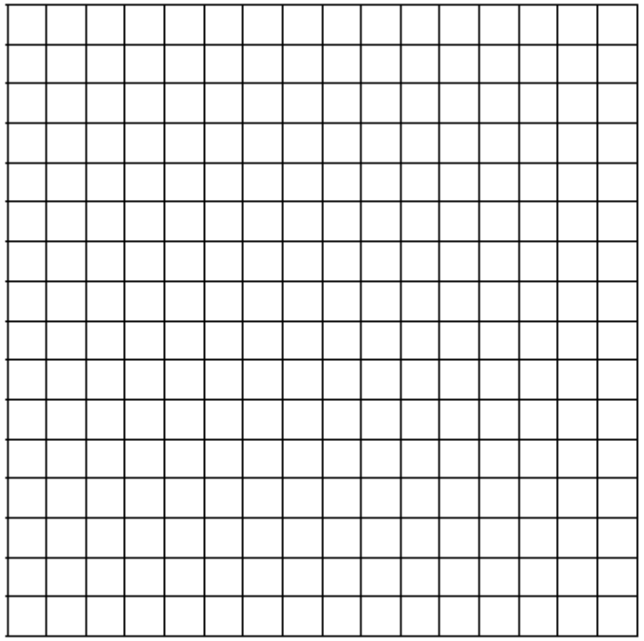


6, 5, 2, 3
4, 2, 5, 2, 3, 1
3, 1, 9, 1, 2, 1
3, 1, 9, 1, 1, 1
2, 1, 11, 1
2, 1, 10, 2
2, 1, 9, 1, 1, 1
2, 1, 8, 1, 2, 1

Extension

Worksheet Activity: Make Your Own Picture

Now that you know how numbers can represent pictures, why not try making your own coded picture for a friend? Draw your picture on the top grid, and when you've finished, write the code numbers beside the bottom grid. Cut along the dotted line and give the bottom grid to a friend to colour in. (Note: you don't have to use the whole grid if you don't want to—just leave some blank lines at the bottom if your picture doesn't take up the whole grid.)



STEM Challenge

What's next?

- **Share your achievements**
  - Send pictures or videos of your activities to us. Make sure its clear what school you are from.

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Please let us know if you are **not** happy with us sharing your images on our own social media forums and website.

- **Try some more Challenges from our website!**