




1D and 2D barcodes

	Age group	11 and above
	Time	30 mins
	Subject	Computing



National Curriculum links

This activity would suit KS3 and KS4 students.

The national curriculum for computing for key stages 3 and 4 aims to ensure that all pupils *“can analyse problems in computational terms”* and *“are responsible, competent, confident and creative users of information and communication technology.”*

England Key stage 3 subject content

Pupils should be taught to:

- understand how instructions are stored and executed within a computer system;
- understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits

England Key stage 4 subject content

Pupils should be taught to:

- develop their capability, creativity and knowledge in computer science, digital media and information technology

Learning outcomes

Pupils should be able to:

- Describe how 1D and 2D barcodes work.
- Compare the advantages and disadvantages of 1D and 2D barcodes.
- Create 1D and 2D barcodes.

Skills developed

- **Decomposition:** Breaking a bigger problem down into smaller more manageable sections.
- **Abstraction:** Removing unnecessary details to focus on the key parts.
- **Collaboration:** Working with others to discuss the problem.

Requirements

Students will need access to computers and the internet to complete this task.

Overview of '1D and 2D barcodes'

Logistics companies use barcodes in many different ways to keep track of products in order to control their inventory and streamline their warehouse and delivery operations. A barcode represents a product in a visual form. It contains lots of information such as the price of the product, where and when it was made.

Barcodes can also be used to track parcels being delivered to customers. Every order a logistics company receives from a customer for a product is given a barcode which contains lots of information such as how a parcel containing the product is packed and which delivery truck it should be sent to. When an item is delivered its barcode is scanned to record this.

A barcode can be in two forms, 1D or 2D.

- A 1D barcode is a series of black and white vertical lines varying in width which usually represents a specific product code or number. It is read using a laser barcode scanner which shines a red laser on the barcode. A white line reflects the light, and a black line absorbs it. The pattern of reflection and absorption is converted into a binary value. This binary value can then act as an input to an external database. 1D bar codes are often used where information on a product change frequently. For example, food items in the supermarket as product prices often change. The 1D barcode (static data) of an item is scanned at the checkout. This informs the till what the item is and the computer in the till then uses a pricing database (dynamic data) to charge the correct amount and remove the item from the inventory.

- A 2D barcode is known as a Quick Response (QR) code. A QR can store much more information than a 1D barcode and an external database is not needed to interpret the code. (<https://www.qr-code-generator.com/qr-code-marketing/qr-codes-basics/> gives more detail on the structure of a QR code.) It can be read by a camera-based imaging scanner like a mobile phone and can be read much quicker than a 1D barcode so is often used on conveyor belts. As a QR code can store a larger set of data than a 1D barcode it can contain a website url. This is used to direct people to a particular website by getting them to scan the QR code with the camera on their phone.

Resource Overview

This resource includes these items:

- Teacher notes.
- Student activity sheet setting out the task and giving the information required for the students.
- Exemplar solutions which teachers may use to support groups of students who need some scaffolding to get started.
- Presentation slides to help explain the tasks.

The task

Use the prompt on slide 2 to find out from students where they have seen barcodes being used. This will allow them to share their own experiences. They may not realise a QR code is a type of barcode.

Then ask students to research 1D and 2D barcodes to find out the following:

- How 1D and 2D barcodes work
- The advantages and disadvantages of each barcode
- The use of each type of barcode

They can record their responses to each section in the table provided.

They must then create 1D and 2D barcodes for 7 products from a chosen retailer. To do this they will have to find individual webpages and product numbers for each of the products so they can create the relevant barcodes. This information is then recorded in the table provided on the student activity sheet.

Supporting notes

One example of how to complete the table containing the 1D and 2D barcodes is given.

Useful websites

The free websites below allow learners to create their own barcodes. The notes contain guidance on how to use these sites.

1. <https://barcode.tec-it.com/en/>
In the centre of the webpage there is a box titled 'Code-128'. Input the text data to be converted to a 1D barcode into this box. Click **refresh** to view the barcode, followed by **download**. The barcode will appear as a file in your download folder.
2. <https://www.qr-code-generator.com/>
Add the website link for the QR code to be generated and then click **download** to use. When you click download a pop up will appear asking you to login, ignore this as the QR code is being generated and downloaded to your download folder. Leave the sign in pop up until the download is complete and then use the 'X' to close the window.

Generation Logistics Education Hub

This resource is one of the many engaging resources available from Generation Logistics on their Education Hub. For more details go to: www.educationhub.generationlogistics.org/