

# Reinforcing Sequencing

Computers today use **digits** to represent information - that's why they're called **digital systems**. The simplest and most common way to represent digits is the binary number system, with just two digits (usually written as 0 and 1). It is called binary because there are only two different digits used, or two states.

## What is it?

The binary number system plays a central role in how information of all kinds is stored on computers. Understanding binary representation can lift a lot of the mystery from computers because at a fundamental level they're really just machines for flipping binary digits on and off. Computers are simple machines, and they need very exact instructions to make them do complex tasks. This is lesson 2 on Binary Numbers.

## Why?

Teaching binary numbers as an introduction to computational thinking introduces students to algorithms and decomposition, as they learn to break down the problems of calculating binary numbers and converting between binary and decimal numbers, into step by step processes that they can follow to solve these problems; it also introduces abstraction, as students learn that two different things can be used to represent any and all information. It shows them that a computer isn't actually that complex, and we use simple concepts in a clever way to make computers do extraordinary things!

## Link to Digital Technologies Curriculum

This activity builds on the first Binary Numbers activity to reinforce algorithmic thinking, decomposition and other components of the first Progress Outcome in **Computational Thinking**. The activity also begins learning towards the first **Designing and Developing Digital Outcomes** Progress Outcome.

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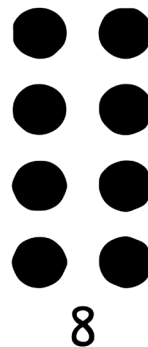


KIA HIHIKO AOTEAROA!

*Discovery*

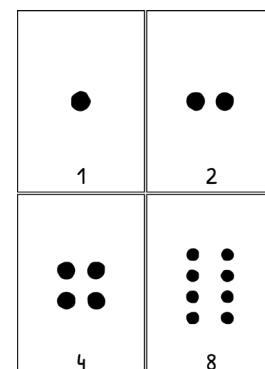
**Mathematics:** Numeracy  
**Literacy:** Speaking  
**Performing Arts:** Drama

## Downloadable Resources



## Binary Cards

(Print 1 per class)



## Binary Cards (Small)

(Print 1 per student)

**Note:** Be sure to print double-sided!

## Activity Background

Computers use on and off to know how to display information or data. We can use anything we like that is opposite to each other.

Today we will look at what opposites are and how we can count using these. If I said "happy face" what would be the opposite? What would the opposite be of cat? (This could be a mouse or a dog).

Introduce two opposite objects. They could be paper plates, dual coloured counters, hats (to put on or off), or two different percussion instruments.

Your play must include a demonstration of one of the following:

- How to count from 0 to 10 or more using binary dots.
- How you would work out the number 5.



# The Activity

Brainstorm together items you could use to make the numbers. It should be different to how it has been demonstrated to the class, so they are not allowed to use cards with dots on them.

In groups of 4 have students decide how they will show ON and OFF. They need to choose which bit they are going to be. (It may help to give them each their own bit card so they remember their number). As well as physical representations like hats, it could be using words (e.g. saying "yes and no"), or musical sounds (high and low, long and short, loud and soft), or light.

8, 4, 2, 1

Have a chance to practise counting binary in their group from 1 to 15.

Once they have done that they change roles to they experience what it's like being each of the different bits:

- The person with 8 takes on the job of 1
- 4 becomes 8
- 2 becomes 4
- 1 becomes 2

When they are ready ask each group to make the number (choose a random number between 0 and 8).

Your plays will typically need 4 students in a group to represent the four bits. If the number of students isn't a multiple of 4, the extra students could take on roles such as taking photos or videos. The roles can swap over so they have a turn at being a "bit" as well as capturing the learning. Alternatively, a smaller group could explore other options, such as one student holding two bits, or using objects as bits on 4 chairs "operated" by the students, so one student can change all of them.



## Extending The Lesson

Reflect after each play is performed to reinforce learning by asking:

1. How did they choose to show on and off?
2. What made the plays interesting or appealing that another person might be able to learn from them?
3. What did you clarify about the binary number system now that you've created your play?
4. What questions do you have after performing your play in relation to the binary number system? ( Typically responses are that they want to understand further how binary numbers are used to show letters, images, videos and all things on a computer - these topics are covered in further lesson plans)

