# Finding the way

## Using Flowcharts to give instructions and analyse processes

# Resource

Secondary

11-14 years

# Contents

# Noteable Activities for Schools: Finding the way

These resources are a guide for teachers to use with the whole class or direct individual students as appropriate. The activities below can be directly distributed to pupils.

For instructions on how to install and use Noteable resources, please look at our guides for teachers in GLOW: GLOW guidance for teachers to start using Noteable.

# Content and Curriculum links

| Level | Context | Indicators |
|---|---|---|
| 11-14 | Using Flowcharts to give instructions and analyse processes | Direction, Shapes, Action |

| Knowledge | Using bullet point lists to give instructions |
|---|---|
| Curriculum links (England) Computing KS3 | • design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems.<br>• understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem. |
| Scottish Curriculum for Excellence | **Experiences and Outcomes:**<br><br>• I am developing my understanding of information and can use an information model to describe particular aspects of a real world system. **TCH 3-13b**<br>**Benchmark:**<br>o Recognises and describes information systems with communicating processes which occur in the world around me.<br>o Explains the difference between parallel processes and those that communicate with each other. |
| All: Cross-curricular opportunities | The activities have identified opportunities for Home Economics, Biology, Geography and Numeracy. |

# What is a flowchart?

A flowchart is like a picture that helps us understand how something works. It's a special kind of drawing that shows the steps of a process or a plan. In simple words, it's like a map that guides you through a journey.

A **flowchart** is like a map that shows the steps of a process from **start to finish**. Imagine you're baking cookies with a recipe. The flowchart would help you follow each step, just like following the recipe instructions. Let's break it down:

1. **Boxes**: In a flowchart, we use **boxes** to represent each step or action. For example, one box might say "Mix ingredients."

2. **Arrows**: We connect the boxes with **arrows** to show the order. So, after mixing ingredients, the arrow points to the next box, which could be "Shape dough into cookies."

3. **Symbols**: Sometimes, we use special symbols. For instance:

   o **Diamond shape**: It's like a decision point. Imagine you're choosing between chocolate chips or raisins for your cookies. The diamond shape helps us decide which path to take.

   o **Oval shape**: Represents the **start** or **end** of the process. It's like the "Begin" and "Finish" signs on a racetrack.

4. **Examples**:

   o **Making a Sandwich**: Imagine making a jam sandwich. The flowchart would have boxes like "Get bread," "Spread jam," and "Put slices together." Arrows connect them in the right order.

   o **Butterfly Life Cycle**: From egg to caterpillar, chrysalis, and finally, a butterfly. Each stage has its own box in the flowchart.

5. **Why Use Flowcharts?**

   o They help us understand **complex processes** quickly.

   o Scientists use them to explain experiments.

   o Writers use them to plan story plots.

   o Math problems? Flowcharts can guide us step by step.

So, next time you're puzzled about a process, think of it like a flowchart – a visual guide to follow!

**Why are Flowcharts Helpful?**

Flowcharts are super useful for a few important reasons:

**Making Programs:** Imagine you want to tell a computer what to do. You need to create a set of instructions called a program. A flowchart helps you plan those instructions step by step, just like a recipe for baking cookies.

**Explaining Ideas:** Sometimes, we have great ideas or plans in our head, but it's tricky to explain them to others. A flowchart makes it much easier to show your ideas to your friends or teachers.

**Flowchart symbols**

The basic symbols you will find in a flowchart are outlined below:

**Start/end**

A flowchart always starts with a shape that looks like an oval, and it ends with another oval shape. It's like saying, "This is where we begin, and this is where we finish."
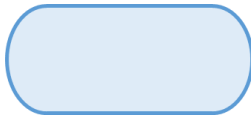
**Arrows and Lines:** In between the start and end, you'll see arrows and lines connecting different shapes. These arrows show the order of the steps or actions.

**Parallelogram:** This shape is used for input or output, like reading information or showing results.
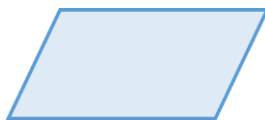
**Rectangle:** This shape represents an action or a task. It's like a command telling the computer (or someone reading it) what to do.
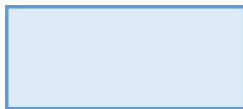
**Diamond:** This shape represents a decision point. It's like asking a question, and depending on the answer, you go in different directions.

# How to Use a Flowchart?

**Example:** Making a Peanut Butter and Jelly Sandwich

Let's create a simple flowchart to explain how to make a peanut butter and jelly sandwich using these shapes:

```
                    ┌──────────┐
                    │  Start   │
                    └──────────┘
                         │
         ┌───────────────┼
         │          ┌──────────────┐
         │          │ Get two slices of
         │          │     bread     │
         │          └──────────────┘
         │                 │
         │          ┌──────────────┐
         │          │ Spread peanut butter
         │          │  on one slice │
  No     │          └──────────────┘
         │                 │
         │          ┌──────────────┐
         │          │ Spread jelly on other
         │          │     slice     │
         │          └──────────────┘
         │                 │
         │          ┌──────────────┐
         │          │ Put the two slices
         │          │   together    │
         │          └──────────────┘
         │                 │
         │            ◇ Is it delicious ◇
         └────────────┘              │ Yes
                    ┌──────────────┐ │
                    │ You are done │◄┘
                    └──────────────┘
                         │
                    ┌──────────┐
                    │   End    │
                    └──────────┘
```
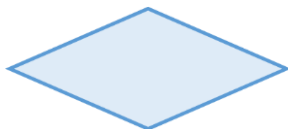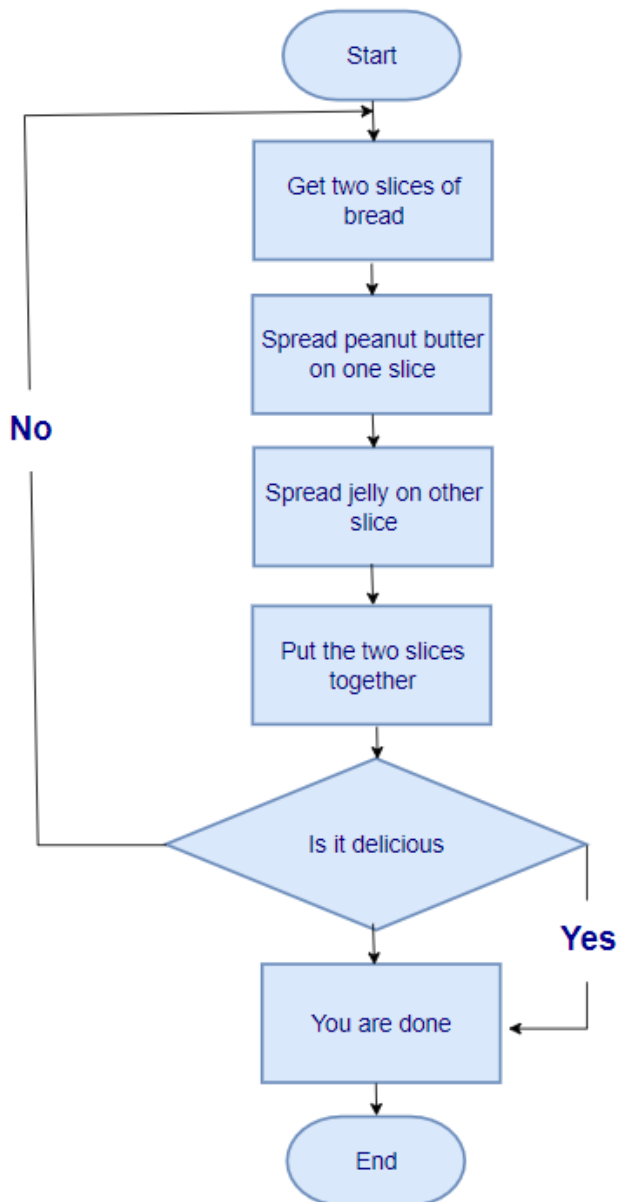
This flowchart helps you follow the steps one by one to make your yummy sandwich!

So, remember, flowcharts are like magical maps that help us understand and explain processes, like making a sandwich or even writing a computer program. They make everything clearer and more fun!

# Another Flowchart Example

An example flowchart is shown in the image below. You want to determine NAAS' size in relation to the apple and the tree.

If NAAS is taller than the apple and smaller than the tree, then his size is between the apple and the tree.
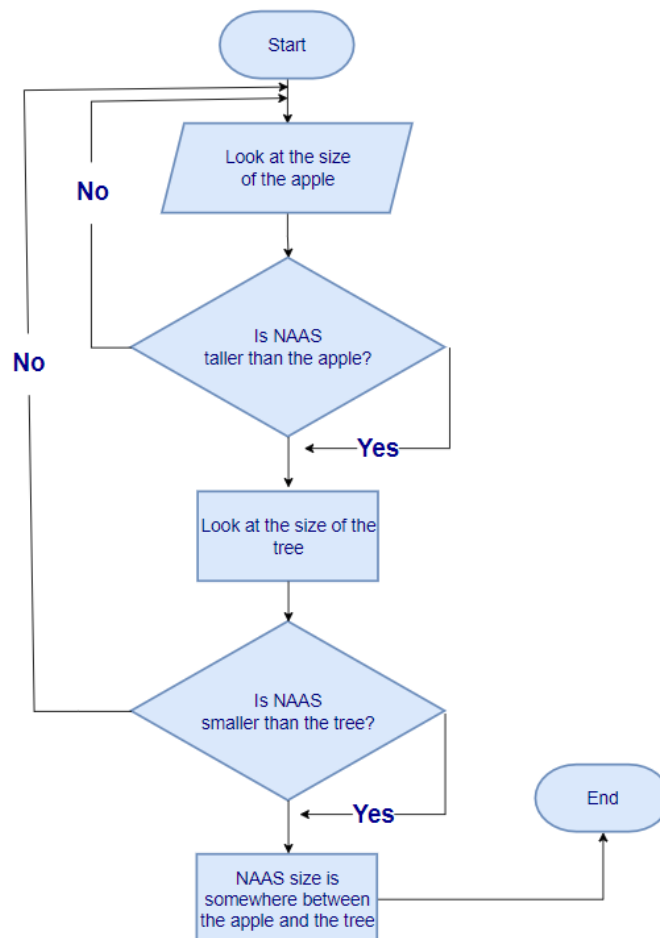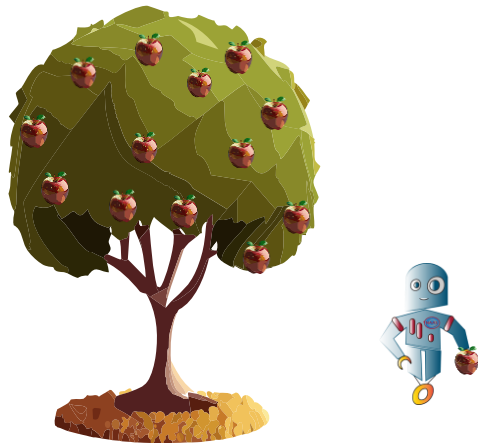
# Activity 1

Your robot friend can reach Don in two main ways: A (yellow line) and B (purple line). Sum the total length of each way and create a flowchart showing the two ways that your robot can bring the batteries to Don. You will be required to turn the algorithm you wrote in activity 1 into a diagram. Use the flowchart symbols shown on the next page.

Be sure you are using the correct symbols as shown earlier in this notebook.

Use the website https://www.draw.io/ to draw your flowchart.

Once you are finished, export a copy as a PNG file.

Display the file in a new Markdown cell in your notebook. Select Edit, insert image.
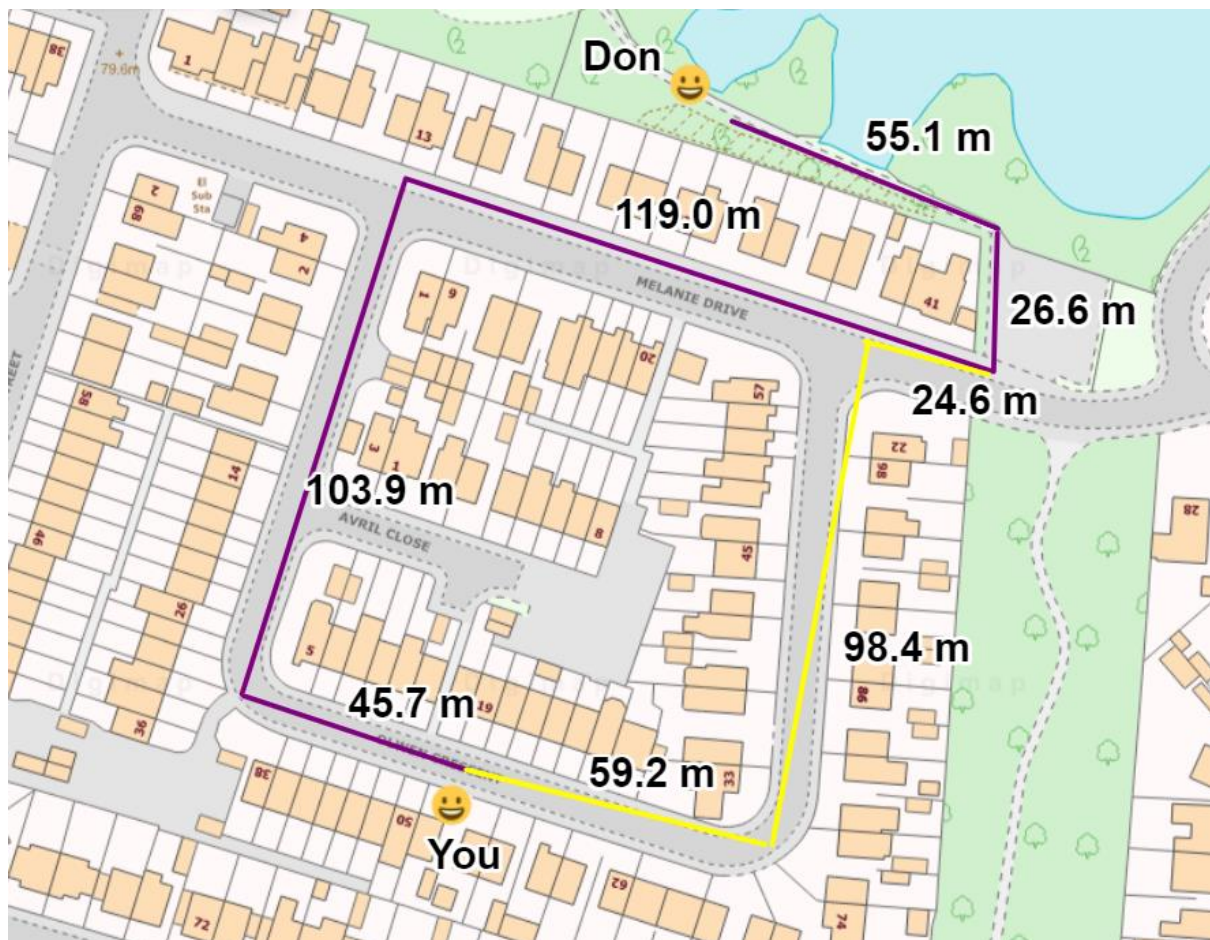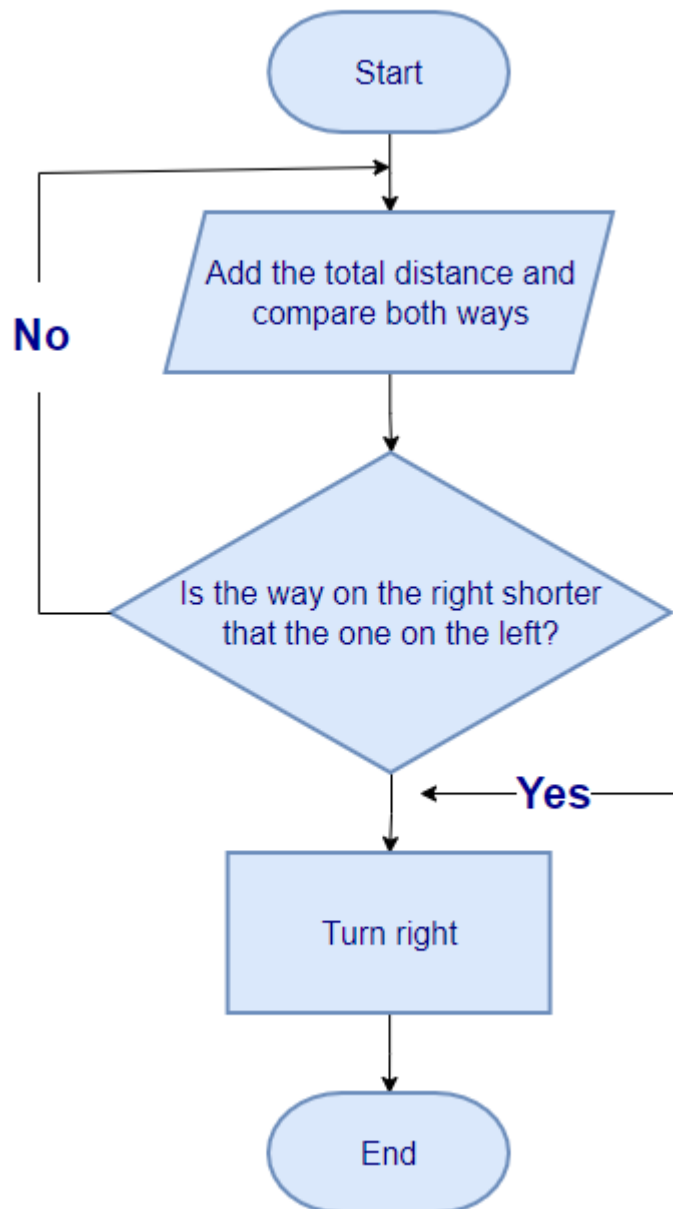
# One possible solution

A possible flowchart solution is shown in the image below. If the way to the right is longer than the way to the left, then you need to re-do your sums, otherwise, you can continue to the next step.

You can use the solution below as an example to build your own flowchart.

```
                        ┌──────────┐
                        │  Start   │
                        └──────────┘
                             │
         ┌───────────────────┤
         │                   ▼
         │          ╱─────────────────╲
         │          │ Add the total   │
    No   │          │ distance and    │
         │          │ compare both    │
         │          │ ways            │
         │          ╲─────────────────╱
         │                   │
         │                   ▼
         │          ╱─────────────────╲
         │         ╱  Is the way on    ╲
         └────────●   the right shorter │
                   ╲  that the one on  ╱
                    ╲   the left?     ╱
                     ╲───────────────╱
                         │        │
                         │   ◄──Yes──┘
                         ▼
                    ┌──────────┐
                    │Turn right│
                    └──────────┘
                         │
                         ▼
                    ┌──────────┐
                    │   End    │
                    └──────────┘
```

# Cross-curricular opportunities

**Home Economics:** Your students can use flowcharts present the steps of recipes or evaluate the health content of packed goods.

**Biology:** Flowcharts are helpful in demonstrating the sequences in photosynthesis, digestive system and any other process that can be followed in steps and with dependences.

**Geography:** You can add an extra challenge to the lesson. Your students can select a map in Digimap for Schools or another mapping tool and create paths and measurements for their peers to create the flowchart.

**Numeracy:** Depending on what you are teaching in Numeracy and Maths, you can use the flowchart as a starting point, you can create a number of activities. For example, students can discuss which way is longer in total, calculate the difference and between the two ways and calculate the distance if a direct line was used from the 'You' point to the final destination. They can then, display their answer as part of the next coding activity (printing messages and information).

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