



## Year 2 – Programming A – Robot algorithms

### Unit introduction

This unit develops learners' understanding of instructions in sequences and the use of logical reasoning to predict outcomes. Learners will use given commands in different orders to investigate how the order affects the outcome. They will also learn about design in programming. They will develop artwork and test it for use in a program. They will design algorithms and then test those algorithms as programs and debug them.

There are two Year 2 programming units:

- Programming A – Robot algorithms (Autumn Term)
- Programming B – Programming quizzes (Summer Term)

### Overview of lessons

Lesson	Brief overview	Learning objectives
1 Giving instructions	Learners will follow instructions given to them and give instructions to others. They will consider the language used to give instructions, and how that language needs to be clear and precise. Learners will combine several instructions into a sequence that can then be issued to another learner to complete. They will then consider a clear and precise set of instructions in	To describe a series of instructions as a sequence <ul style="list-style-type: none"><li>• I can follow instructions given by someone else</li><li>• I can choose a series of words that can be acted out as a sequence</li><li>• I can give clear instructions</li></ul>

	relation to an algorithm, and will think about how computers can only follow clear and unambiguous instructions.	
2 Same but different	Learners will focus on sequences, and consider the importance of the order of instructions within a sequence. They will create sequences using the same instructions in different orders. They will then test these sequences to see how the different orders affect the outcome.	<p>To explain what happens when we change the order of instructions</p> <ul style="list-style-type: none"> <li>• I can use the same instructions to create different algorithms</li> <li>• I can use an algorithm to program a sequence on a floor robot</li> <li>• I can show the difference in outcomes between two sequences that consist of the same instructions</li> </ul>
3 Making predictions	Learners will use logical reasoning to make predictions. They will follow a program step by step and identify what the outcome will be.	<p>To use logical reasoning to predict the outcome of a program</p> <ul style="list-style-type: none"> <li>• I can follow a sequence</li> <li>• I can predict the outcome of a sequence</li> <li>• I can compare my prediction to the program outcome</li> </ul>
4 Mats and routes	Learners will design, create, and test a mat for a floor robot. This will introduce the idea that design in programming not only includes code and algorithms, but also artefacts related to the project, such as artwork.	<p>To explain that programming projects can have code and artwork</p> <ul style="list-style-type: none"> <li>• I can explain the choices that I made for my mat design</li> <li>• I can identify different routes around my mat</li> <li>• I can test my mat to make sure that it is usable</li> </ul>

5 Algorithm design	Learners will design an algorithm to move their robot around the mat that they designed in Lesson 4. As part of the design process, learners will outline what their task is by identifying the starting and finishing points of a route. This outlining will ensure that learners clearly understand what they want their program to achieve.	To design an algorithm <ul style="list-style-type: none"> <li>• I can explain what my algorithm should achieve</li> <li>• I can create an algorithm to meet my goal</li> <li>• I can use my algorithm to create a program</li> </ul>
6 Break it down	Learners will take on a larger programming task. They will break the task into chunks and create algorithms for each chunk. This process is known as 'decomposition' and is covered further in key stage 2. Learners will also find and fix errors in their algorithms and programs. They will understand this process to be 'debugging'.	To create and debug a program that I have written <ul style="list-style-type: none"> <li>• I can test and debug each part of the program</li> <li>• I can plan algorithms for different parts of a task</li> <li>• I can put together the different parts of my program</li> </ul>

## Progression

In advance of the lessons in this Year 2 unit, learners should have had some experience of creating short programs using floor robots and predicting the outcome of a simple program. This unit progresses learners' knowledge and understanding of algorithms and how they are implemented as programs on digital devices. Learners will spend time looking at how the order of commands affects outcomes. Learners will use this knowledge and logical reasoning to trace programs and predict outcomes.

## Curriculum links

### National curriculum links

- Understand what algorithms are, how they are implemented as programs on digital devices, and that programs execute by following precise and unambiguous instructions
- Create and debug simple programs
- Use logical reasoning to predict the behaviour of simple programs

## Subject knowledge

This unit focuses on developing learners' understanding of computer programming. It highlights that algorithms are a set of clear, precise, and ordered instructions, and that a computer program is the implementation of an algorithm on a digital device. The unit also introduces reading 'code' to predict what a program will do. Learners will engage in aspects of program design, including outlining the project task and creating algorithms.

When programming, there are four levels that can help describe a project, known as 'levels of abstraction'. Research suggests that this structure can support learners in understanding how to create a program and how it works:

- Task — what is needed
- Design — what it should do
- Code — how it is done
- Running the code — what it does

Spending time at the 'task' and 'design' levels before engaging in writing code aids learners in assessing the achievability of their programs and reduces the cognitive load for learners during programming.

Learners will move between the different levels throughout the unit.

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