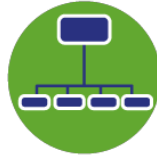# Lego Building Algorithm

## Concepts and approaches

**Algorithms**    **Decomposition**

## Overview

In this lesson pupils create a simple model (out of Lego or similar) and then take photos to create instructions (an algorithm) for other pupils to recreate their model. By removing one block at a time they are decomposing the problem into manageable steps. You may wish to split this lesson into two depending on your pupils.

## Pupil Objectives

- I can create clear instructions for someone else to follow.

## Introduction

- Explain that they are going to be creating some instructions for other people to follow. If appropriate explain to the pupils that these are algorithms (a sequence of instructions or rules to get something done).
- Provide each pupil with the same 3 Lego blocks. Show a sequence of three photos and ask the pupils to build them up as shown in the example below.

- How did they get on? How easy were the instructions to follow? Were they clear? If appropriate, discuss what makes good instructions (they need to be clear, precise, accurate).
- Explain to the pupils that they are going to design their own simple model using Lego and then create the instructions for another pupil to make the same model.

## Main Activity

### Model Making

- Give pupils a set of ten random blocks of Lego. You may wish to give all pupils the same set of ten blocks or let them choose them – you know your pupils best!

- Give the pupils time to create a model using their set of blocks.
- Explain they are now going to take their model apart, step-by-step, taking photographs of each step. They will be creating clear instructions that someone else can follow to build their model.
- You may wish to demonstrate this process to your pupils first.
- If appropriate, explain to pupils they are using decomposition as they break down the task of building their model into small steps.

### Photography

- Once completed they should photograph the completed model, using a digital camera or tablet.
- They should then take one brick off their model and re-photograph the model plus the removed brick next to the model.
- Repeat the process until all of the bricks have been removed – each time they should just include the last removed block and clear away the rest (see example).
- If pupils used a different set of blocks, they should also take a photo of all the individual blocks, to show what was used.



### Creating their algorithm

- Invite pupils to upload the photos to a computer and add to suitable software, or add to an appropriate presentation or image app on the tablet.
- Ask pupils to arrange their pictures in the reverse order that they took them in, so that they start with the photo of 2 blocks and end up with a completed model. They should label the pictures in numerical order. Some pupils may need support with this.
- Once they have finished, ensure they save their work.
- Pupils should then give their algorithm (either printed out or displayed on the tablet or computer) to another pupil to follow to recreate the model.

## Plenary

- Ask pupils if their instructions were successful. How do they know? For example, were they were able to recreate the model? Were the instructions clear and easy to follow?
- If they didn't work, can they discuss with their partner how to make the instructions better? They will be collaborating to evaluate their work. If you have time pupils could amend their instructions to debug them.
- Revisit (or introduce) the term algorithm and what it means (a sequence of instructions or rules to get something done). Can they think of any more examples of instructions that they have to follow in their everyday life, e.g. a recipe, instructions from a teacher?
- Revisit (or introduce) the term decomposition and what it means (to break down a problem into smaller parts). What did they have to break down in this activity?

**Differentiation**

**Support:** Pupils may require help to use the camera and to upload the images to a computer. You could use fewer bricks with less able pupils.

**Stretch & challenge:** Pupils try to write the instructions rather than just use photographs. Provide a completed model and an algorithm to build it that includes an error. Can the pupils debug the algorithm? You could discuss more examples of decomposition, e.g. how can they break down the task of getting ready for school into smaller parts [having breakfast, having a wash, brushing teeth, getting dressed etc]?

**Extension Ideas:** Ask pupils to create an algorithm to enable someone to recreate a simple drawing such as a house or a smiley face. You could create a whole class algorithm for an activity, such as going to assembly or getting ready for break.

# Teaching Notes:

## Concepts and approaches

- Pupils are using algorithms to create a sequence of instructions.
- Pupils use decomposition to break down the task into smaller steps.
- Pupils may also use collaboration, evaluation and debugging to test and improve their algorithm.

## Curriculum Links

- Computing: Algorithms and decomposition are key concepts of computational thinking.
- Digital Literacy: Taking and using digital images.
- PSHE: Interacting with others.
- Maths: Counting to 10.
- English: Following instructions.

## Resources

Example of algorithm

Digital camera plus computer or tablet with camera

This resource was designed in conjunction with Matthew Parry, specialist teacher of Computing at a school for pupils with special educational needs.