Lists

Ages: 11-14
Length: 1 hour
Equipment: PDF print out

Introduction

This lesson introduces the relevant words; **_lists_** through activities that link to student's lives to help them relate to the concepts introduced. This lesson will build upon prior learning relating to algorithms.

Curriculum Alignment	• UK National Curriculum Computing Key Stage 3
Learning Objective	• Identify a list in block-based code and python • Describe what a list is • Create and use a list in the MiRo simulator
Keywords	• Procedure • Functions • Comments
Resources	• Procedure and Algorithm steps list • Completed Procedure and Algorithm steps list
Lesson Sections	• Setting the Scene • Activity 1 – Identifying procedures • Activity 2 – MiRo simulator • Summary

Setting the Scene

> Do you follow a list or write a list to remember items?

The main list a family may use is a shopping list before a weekly shop

Concept	How it is used
A **_list_** is like a variable as it is a storage location within a program. But whereas a variable can only store one item, a list can store multiple items. *Can you think of a list you have written with items on?*	When you write code, it can save a lot of time if you have a list of items that can be called upon when required. A **_list_** is a set of items that can be called upon, added to, and deleted from, within the program.

A **_list_** has to have a suitable name, the same as a variable, and named effectively.

Activity 1

Activity 1 is focused on getting students to think about what a **_list_** is and relate this to their everyday tasks.

Scenario 1	Scenario 2
You are making a cake and the recipe states what ingredients are required, you use this to make a list of shopping items that need to be purchased to be able to make the cake.	You are playing a game where you have a set of items that need to be collected throughout the game to be able to complete the level. This list is not written down but may be visible as a checklist of items to collect.

Do you write a list for birthdays or Christmas?

Small Group Activities

To create a list in Python you first need to define the name for the list. This is done in the same way as a variable, using camelCase or snake_case.

- camelCase = no spaces, lowercase letters with the first letter of the 2nd and consecutive words, capitalised.
- snake_case = lowercase and spaces replaced with underscores.

Activity 1 -
1. Look at the variable names and identify if they are **camelCase** or **snakeCase**
2. Given the naming convention, write the correct variable/list name.

With a list items are encased in square brackets '[ ]' and each item is separated with a comma.

    shoppingList = ["bread", "sausages", "cheese", "chocolate"]

The list items can include:
- a string defined by quote marks around the item
- an integer defined by a whole number with no quote marks

Activity 2 - Look at the scenarios given and write out the lists as python code. The aim is to build students' knowledge of structuring a list in python code.

Scenarios on student worksheet:
1. The mother is leaving to do a weekly food shop and has to get the following items: cheese, chocolate, lettuce, tomatoes, potatoes, biscuits and ham.
a. *shoppingList = ["cheese", "chocolate", "lettuce", "tomatoes", "potatoes", "biscuits", "ham"]*

2. For christmas this year I am going to ask santa for socks, crayons, xbox, shoes, clothes, teddies and jigsaws.
a. *christmasList = ["socks", "crayons", "xbox", "shoes", "clothes", "teddies", "jigsaws"]*

3. The grades my class achieved after the last assessment were: 1, 1, 2, 3, 4, 4, 4, 4, 4, 4, 4, 5, 7, 9
a. *classGrades = [1, 1, 2, 3, 4, 4, 4, 4, 4, 4, 4, 5, 7, 9]*

> We use lists in many ways in the everyday lives from Christmas lists to shopping lists.

Differentiation
*   If pupils need extra support, working together can aid understanding as well as starting the list off or giving the students the sections to pieces together.

*   For higher ability pupils ask them to create their own scenario to give to other pupils.
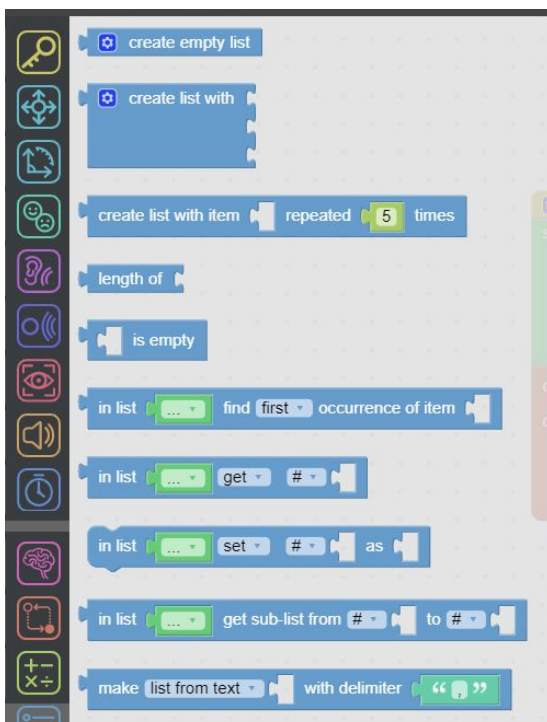

What are the blocks available for _**lists**_? They are located within the 'lists' tab.

However, the naming of the list is created in the same way as a variable, under the Variables tab.

Once you create the name of the list as a variable, you use the blocks within the list tab to assign the list items.

Activity 3 - Using the worksheet and one of the scenarios from activity 1, draw out what the blocks would look like for the list.

set [list ▾] to [⚙ create list with
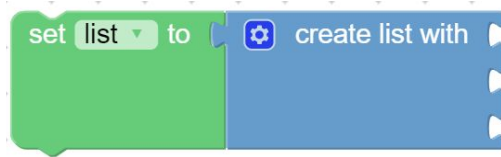
The green block is the variable block. The blue block is attached to the variable name to define it now as a list, containing more than one item.

How can we get MiRo to use a list to demonstrate a range of sounds it can make?

We are going to create a program to define a *__list__* of sounds.

Algorithm for program:

1. sounds = [200, 400, 600, 800, 1000]
2. for each item in list
   a. play sound
   b. wait 1 second

What would the name of your list be? – soundRange?
Why is the name of the list just as important as the content?

Using the algorithm as your plan, can you create the program in the MiRo simulator?

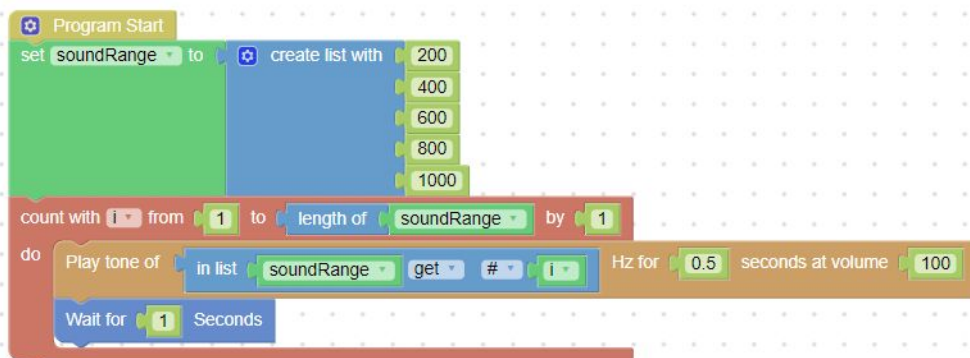Remember there is no fail in computing only debugging, fixing and learning!

Step-by-Step

Activity 2 Program solution
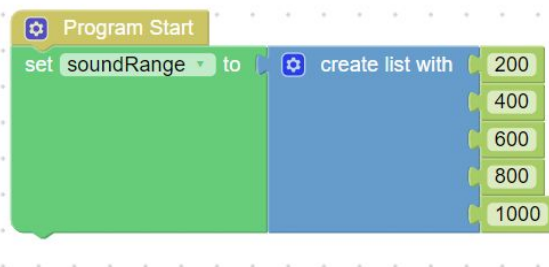*NB. There can be more than one solution in programming, encourage experimentation and use solution below as a guide*

part (a)

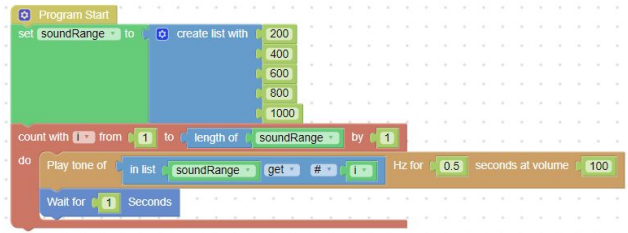| Step 1-5	** Encourage students to use right click and duplicate instead of finding the blocks again.
➜ Add **Program Start** from **Setup**. ➜ Create the variable **soundRange** from the **Variables** icon. ➜ Add **set [variable] to** from **Variables.** ➜ Connect to the **Program Start** block. ➜ Set variable to **soundRange** ➜ Add **create list with** from **Lists.** ➜ Connect to **set soundRange to** block. ➜ Click the settings icon and add two more items to the block. *Drag a new item from the left to under the others on the right.* ➜ Add **[0]** blocks x 5 ➜ Connect them to the end of the **create list with** block. ➜ Set in order to **200**, **400**, **600**, **800**, **1000**	 ** Opportunity to discuss what the data type of the list items are. All of the items are integers as they are whole numbers. **Opportunity to discuss the similarities and differences between a variable and a list. A variable contains a single item A list contains multiple items Both list and variables are named in the same way and here camelCase is used.

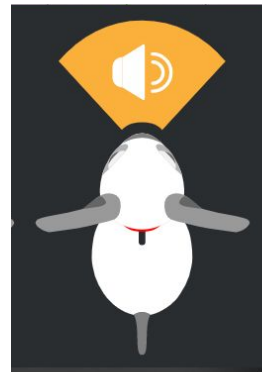|	
Step 6-9 ➔ Add **count with [i]** block from **Loops**. ➔ Connect to the bottom of the list. ➔ Add **length of** block from **Lists.** ➔ Connect it on top of where the number 10 is on the loop block. ➔ Add **soundRange** from **Variables.** ➔ Connect it at the end of the **length of** block. ➔ Add **play tone** block from **Voice.** ➔ Connect it inside the loop. ➔ Add **in list [ ] get #** block from **Lists.** ➔ Connect it on top of the number 500. ➔ Set the list name to **soundRange.** ➔ Add **wait for 1 second** block from **Time.** ➔ Connect under the **play tone** block.	 The loop iterates over the list of items storing the item with each iteration in the variable **i**. By using the length of the list as the end of the loop count, if further items are added to the list then the loop will account for this automatically. This makes the code more efficient.
Step 10 ➔ Click Simulator Play OR ➔ Click Robot play	** If you are using the physical MiRO ensure the IP address is correctly added to the onscreen code to allow the code to be communicated to MiRO to action. ** You can see the sounds being played on the sound icon on the MiRo simulator.

part (b)

Activity 2 - Program solution - Part 2 Moving into Python
Step 1 ➔ To flip to look at the python code, click the **python** button at the top of the white canvas. ➔ Make sure the lock is locked to see the python code for the program connected.	

Can you find the list?	Located roughly on line 23.
What code defines a list?	soundRange = [200, 400, 600, 800, 1000]

Step 2 ➔ Locate the list items. ➔ Click the lock icon between the blockly and python buttons. ➔ The screen will go black for editing.	soundRange = [200, 400, 600, 800, 1000]

Step 3 ➔ Add to the list items using a comma and increasing the number by 200 each time. soundRange = [200, 400, 600, 800, 1000, 1200, 1400, 1600, 1800]	

Step 4
➔   Run your program
➔   Experiment with the settings and investigate:
  -    Change the list items to find a suitable sound range
  -    Change the time set within robot.sleep(1) to experiment with the time delay between sounds.

Summary

Have a discussion with the class about what they have learnt in the lesson. Discuss the new word learnt **lists** and talk through any difficulties they had.

Ask students to complete the self-assessment and can be done by thumbs up, down and centre or using the images; on the following 3 questions.

Questions
Can you identify a list in block-based code and python?
Can you describe what a list is?
Can you create and use a list in the MiRo simulator?