

# Selection

Ages: 7-11

Length: 1 hour

Equipment: PDF print out

## Introduction

This lesson introduces the relevant words; **selection**, **decision** and **flowchart** 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 algorithm, sequence and repetition.

|                             |   |
|-----------------------------|---|
| <b>Curriculum Alignment</b> | <ul style="list-style-type: none"><li>• UK National Curriculum Computing Key Stage 2</li><li>• Australian National Curriculum Digital Technologies F-2 ACTDIP004</li><li>• Australian National Curriculum Digital Technologies 3-4 ACTDIP010</li><li>• US Computer Science Framework Concepts K-2. Computing Systems, Algorithms and Programming</li><li>• US Computer Science Framework Concepts 3-5. Algorithms and Programming</li></ul> |
| <b>Learning Objective</b>   | <ul style="list-style-type: none"><li>• To identify selection within an algorithm</li><li>• To demonstrate the use of selection</li></ul>   |
| <b>Keywords</b>             | <ul style="list-style-type: none"><li>• Selection</li><li>• Decision</li><li>• Flowchart</li></ul>  |
| <b>Resources</b>            | <ul style="list-style-type: none"><li>• Paper and pens</li><li>• Flowchart worksheet</li><li>• Blank Flowchart worksheet</li></ul>  |
| <b>Lesson Sections</b>      | <ul style="list-style-type: none"><li>• Setting the Scene</li><li>• Activity 1 – Flowcharts</li><li>• Activity 2 – MiRo simulator</li><li>• Summary</li></ul>   |

## Setting the Scene

How do you decide on what to wear in the morning?

A decision can be made in a morning by looking at the weather.

| Concept  | How it is used   |
|--|--|
| <p><b>IF</b> the weather is cold; <b>do</b> put a jumper on<br/><b>IF</b> the weather is hot; <b>do</b> put your shorts on</p> <p><i>Can you think of any other statements relating to clothing and weather?</i></p> | <p>When you write code, it is not always as straightforward as following the sequence from top to bottom. There can be a <b>selection</b> (a decision) made within the code to determine the next step in the algorithm.</p> |

You can show the selection within planning of an algorithm in a flowchart using a diamond shape with two possible outcomes.

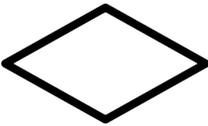
First let us look at how to create a flowchart.

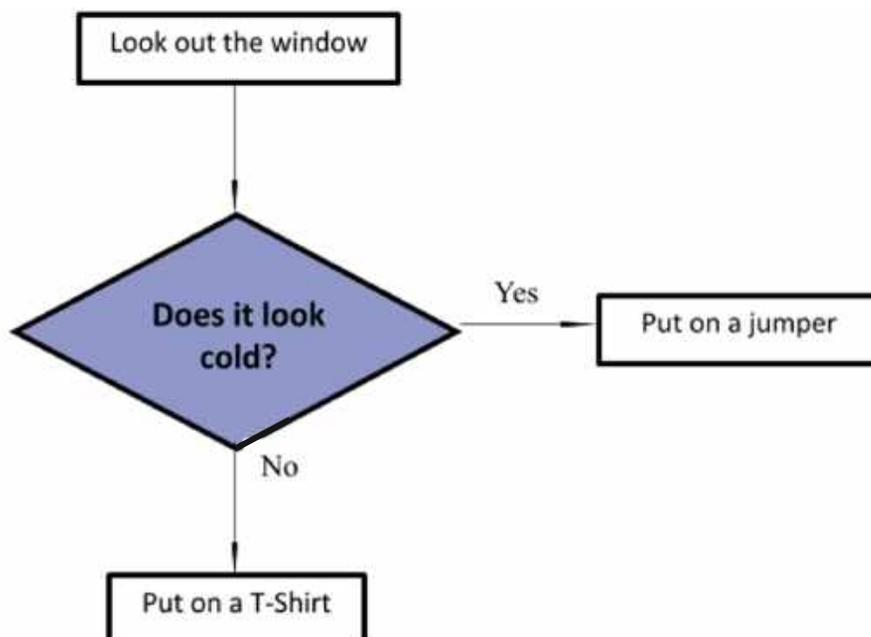
## Activity 1

Activity 1 is focused on getting students to think about **selection** and how this can be shown within a **flowchart**. Pupils will look at the shapes utilised when building a flowchart and demonstrate the use of selection.

| Scenario 1  | Scenario 2  |
|---|---|
| <p>You are making a cup of tea for a friend; there are decisions that must be made to make it right for that person:</p> <ul style="list-style-type: none"><li>• Do they want milk?</li><li>• Do they want sugar?</li></ul> | <p>You want to play on your Xbox, but you have got homework to do:</p> <ul style="list-style-type: none"><li>• Do you complete your homework first?</li></ul> |

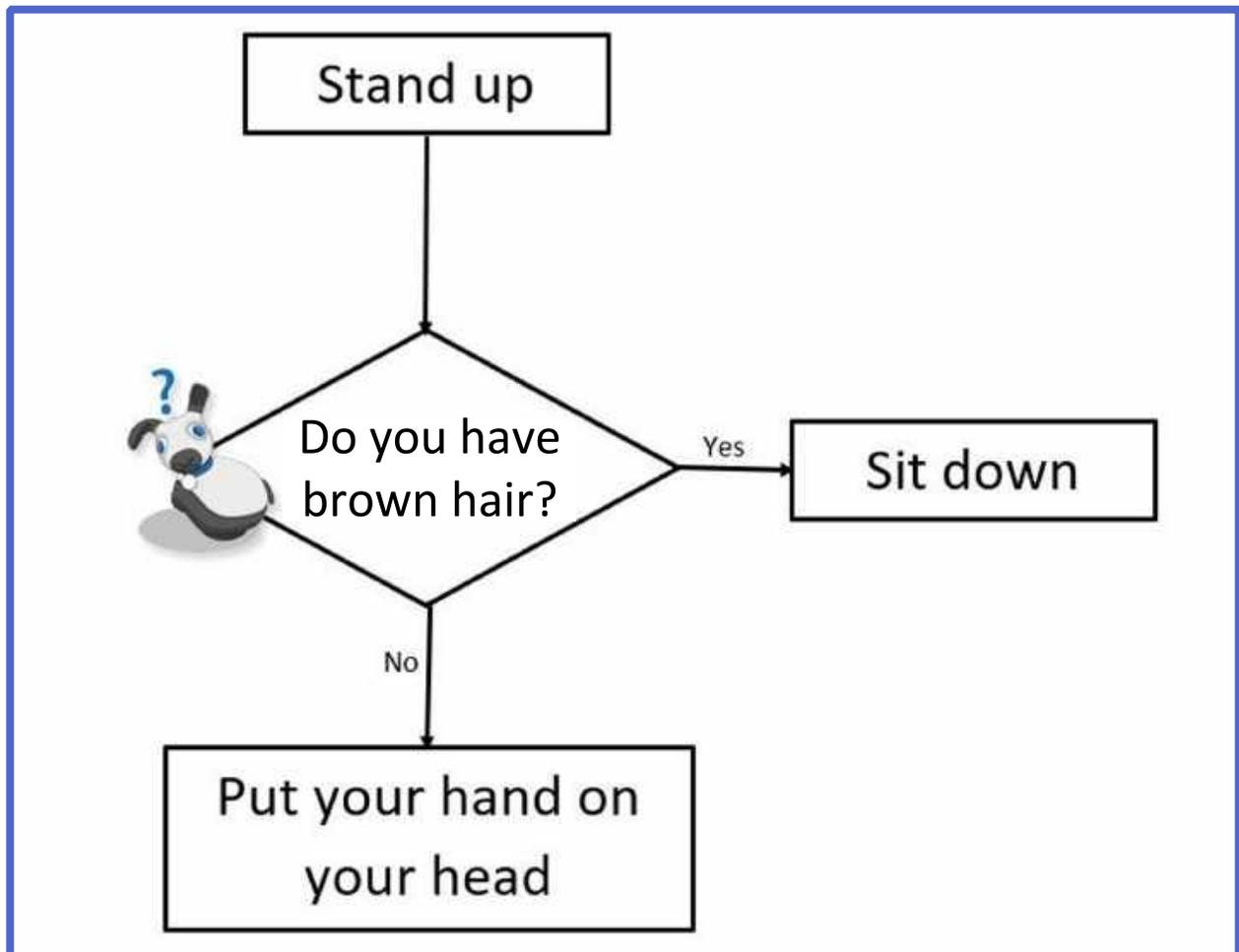
Do you have any other decisions you make daily?

|   |                 |   |
|---|-----------------|---|
|  | <b>Process</b>  | The ' <b>process</b> ' is a step within the algorithm                                 |
|  | <b>Decision</b> | The ' <b>decision</b> ' is shown by two possible outcomes based on the decision made. |



## Whole Class Activity

Display the flowchart on the board; there is a clear question that requires an action from the pupils. Discuss how this could be changed to set a different action and what effect would it have on the action taken if the question was changed to 'are you a boy?'



*NB. For any students that may require the image closer, there is a printable version to add to desks*

## Small Group Activity

Split the students into small groups and give them a blank piece of paper.

In your group, I want you to think how the flowchart for making a pizza should be laid out and where the correct answer should be from the **decision** and **selection** made.

Encourage discussion within the group, ask them to think about the last time they ordered a pizza or made a pizza and how they thought through the toppings they wanted to add.

The output of this flowchart is the chosen pizza and depending on the **selection(s)** made, depends on the pizza output. Try this out with the person next to you.

The completed flowchart is for the teacher only and a space could be added to the student version to draw their completed flowchart and the questions could be split to allow the students to answer or be left as teacher led questioning.

A question after the completed flowchart for students to answer:

How could you make the flowchart steps more precise to follow?

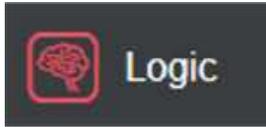
| Questions   | Completed Flowchart  |
|---|--|
| <p><b>Why is there an arrow from the 'Yes' outcome to the 'No' output?</b></p> <p><i>The task still needs to be completed and forms the next step in the algorithm.</i></p>                                       | <pre> graph TD     A[Roll out pizza dough into a circle] --&gt; B[Add tomato sauce]     B --&gt; C[Add cheese]     C --&gt; D{Do you want pepperoni?}     D -- YES --&gt; E[Add pepperoni]     D -- NO --&gt; F[Put pizza in the oven]     E --&gt; F           </pre> |
| <p><b>Could you add more decisions to be made in the algorithm?</b></p> <p><i>Yes, you can have one decision after another and as long as there is a 'yes and no' output it can go into another decision.</i></p> |  |
| <p><b>Can you draw the algorithm to add another decision; another topping following the decision on pepperoni?</b></p> <p><i>This can follow the 'yes' or the 'no' outcome from the first decision.</i></p>       |  |

### Differentiation

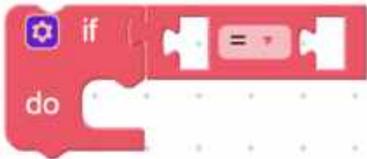
- If pupils need extra support start the flowchart off for them in by laying out the first few flowchart symbols.
- For higher ability pupils there is the option to give them the blank flowchart symbols to add the content of on the flowchart as well as the sequence.

## Activity 2 Part 1

What are the blocks available for selection?



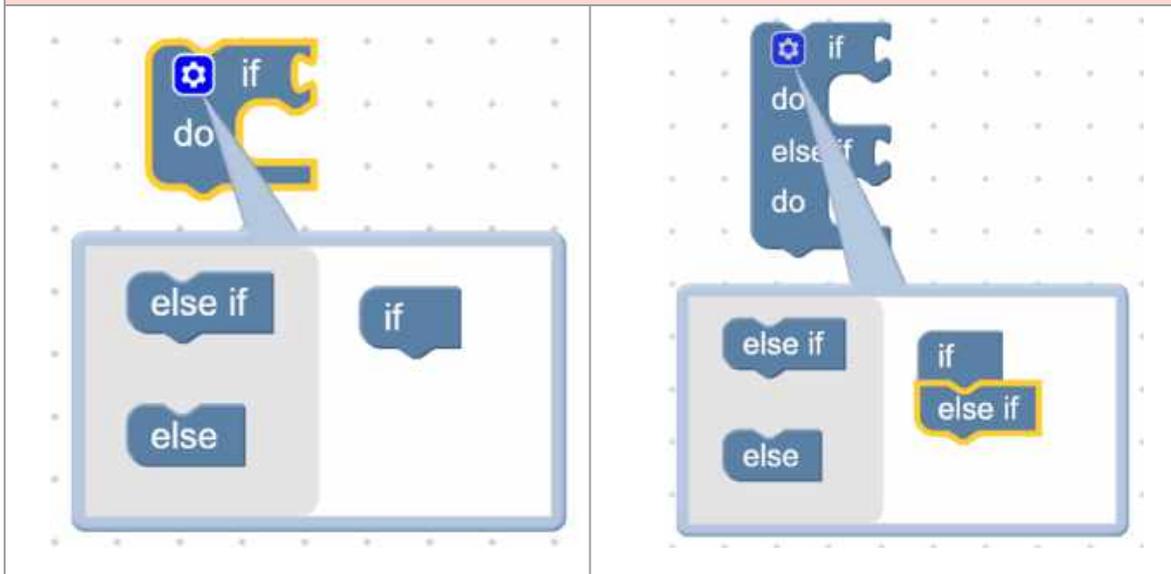
They are located within the 'Logic' tab. In computing 'Logic' means there is a true and a false output; just like our flowcharts.



In the IF/DO block the question connects after the IF. The computer will look at the IF and the decision to be made, the selection will determine what the output will be. This is called a conditional statement.

If you wanted to have one decision after another like the flowchart, you need to click the blue settings wheel and click and drag 'else if' or 'else' and connect it to the 'if' visible in the pop-up window.

*NB: click the blue settings wheel again to close the view*



Wave your hands in the air... IF you see the teacher STOP .... Else keep waving

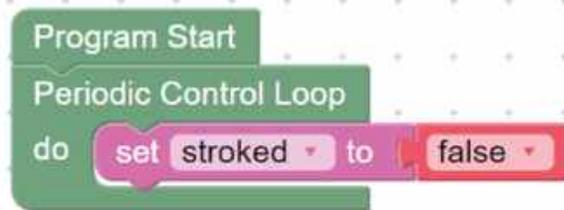
## How can we get MiRo to make a selection in its movement?

We are going to create a program where MiRo will open its eyes, wag its tail and display green colours IF you pat MiRo's head. If MiRo does not sense a touch, it will close its eyes and display red colours.

### Step 1-6

- Add 'program start' from 'Setup'
- Add 1 x Periodic Control Loop block
- Add 1 x set item block
- Click the arrow next to the word 'item'
- Select 'rename variable'
- Rename variable to: 'stroked'
- Add 1 x true block
- Change 'true' to 'false' within the drop-down menu

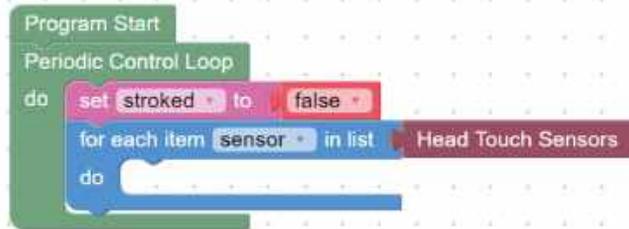
\*\* The periodic control loop block will ensure all blocks inside continue to run until the program is stopped.



\*\*By setting the variable to false at the start, the output of the conditional statement checking if the sensor is true can be used.

### Step 7-9

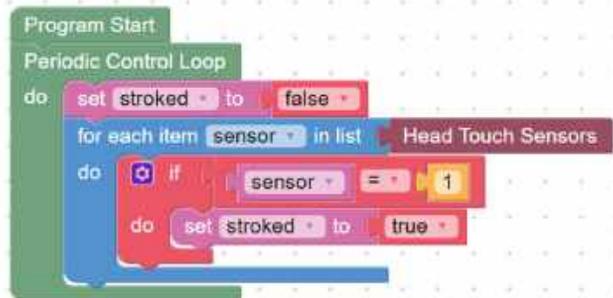
- Add 1 x for each item 'i' in list block
- Click the arrow next to the letter 'i'
- Select 'rename variable'
- Rename variable to: 'sensor'
- Add 1 x head touch sensors block



\*\*The range of the sensor is set within a list of values and therefore has to be looked at using a list block.

### Step 10-16

- Add 1 x if do block
- Add 1 x ( ) = ( ) block
- Add 1 x sensor block
- Add 1 x (0) block
- Set the math block to: 1
- Add 1 x set stroked to block
- Add 1 x true block

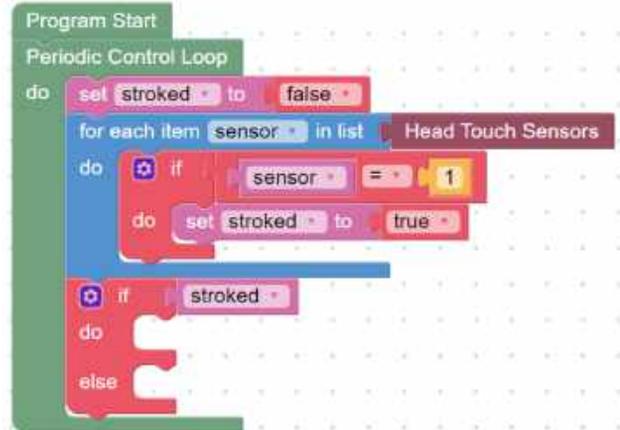


\*\*The conditional statement shows the selection within the program. Here it is:

**If** the sensor variable (which looks at the list of values for the head touch sensor) is equal to 1  
**Do** set the variable 'stroked' to true.

### Step 17-19

- Add 1 x if do block
- Add 1 x else section by clicking the blue settings icon and dragging an else over to connect under the if section.
- Add 1 x sensor block



```
Program Start
Periodic Control Loop
do
  set stroked to false
  for each item sensor in list Head Touch Sensors
  do
    if sensor = 1
    do
      set stroked to true
    if stroked
  else
```

\*\*Once the first conditional statement has completed and set the variable stroked to true, the program will move onto the next 'selection' required within the program.

\*\* 'if stroked' - means if the variable 'stroked' is true.

### Step 20-26

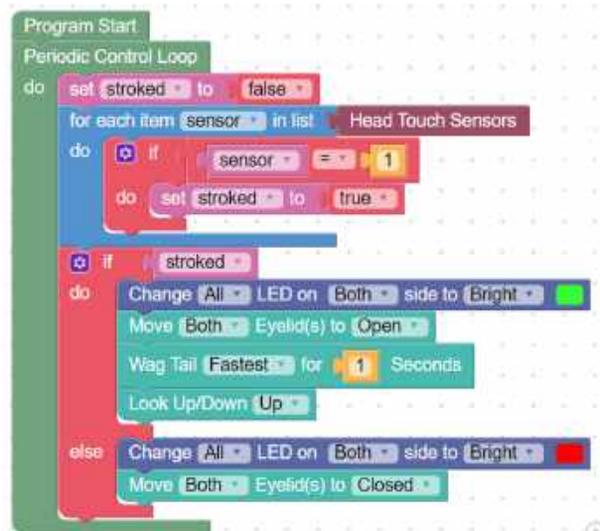
- Add 1 x change front LED on left side to Bright red block
- Set the block to 'All' LED on 'Both' side to Bright 'green' within the drop-down menus
- Right click and duplicate the 'change All LED on Both Bright green' block
- Set colour to 'red'
- Add: 1 x Move Left Eyelid(s) block, 1 x Wag Tail block, 1 x Look Up/Down block
- Set the blocks to open both eyelids and wag tail fastest for 1 second
- Right click and duplicate the 'move both eyelids to open' block
- Set to 'closed'

**if** the 'stroked' variable is true:

**do** change the lights on MiRo to green, open the eyes, look up and wag the tail for 1 second.

**else:**

Change the lights on MiRo to red and close the eyes.



```
Program Start
Periodic Control Loop
do
  set stroked to false
  for each item sensor in list Head Touch Sensors
  do
    if sensor = 1
    do
      set stroked to true
    if stroked
    do
      Change All LED on Both side to Bright green
      Move Both Eyelid(s) to Open
      Wag Tail Fastest for 1 Seconds
      Look Up/Down Up
    else
      Change All LED on Both side to Bright red
      Move Both Eyelid(s) to Closed
```

### Step 27

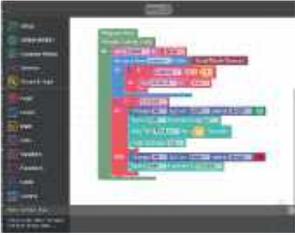
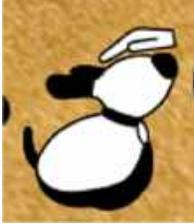
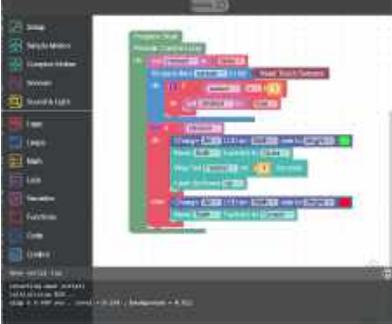
- Click Simulator Play OR
- Click Robot play

\*\* 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.



\*\* If you are using the simulator it is recommended to zoom in to see miRo clearly but not essential

Following how the program executes will help the pupils identify when an error occurs.

|                                |  |   |  |
|--------------------------------|--|---|--|
| <p><b>Follow a program</b></p> |  <p><b>Script at bottom of screen shows code is ready to run.</b></p>  |  <p><b>Simulate the stroking of the head by clicking this icon OR With physical MiRo - stroke MiRO's head</b></p> |  <p><b>Script at bottom shows program ran correctly.</b></p> |
| <p><b>See the output</b></p>   | <p><b>IF</b> your hand touches MiRo's head:<br/>MiRo will open its eyes, wag its tail and display green colours on its body<br/><b>ELSE:</b><br/>MiRo will close its eyes, and display red colours on its body</p> |   |  |



**Using this flowchart as your plan, can you create the program in the MiRo simulator?**

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



## Summary

Have a discussion with the class about what they have learnt in the lesson. Discuss the new words learnt: **selection**, **flowchart** and **decision**, 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 follow a flowchart?                                  |
| Can you draw a flowchart with a decision, showing selection? |
| Can you use selection within a program to control MiRo?      |