

The logo for Purple Mash is contained within a black, rounded rectangular shape that resembles a sticky note with a torn top-right corner. The word "purple" is written in a lowercase, purple, sans-serif font, and the word "mash" is written in a lowercase, white, sans-serif font directly below it.

**purple
mash**

**Purple Mash
LogoBot Guide
and MicroBit
Lesson Ideas.**

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Introduction

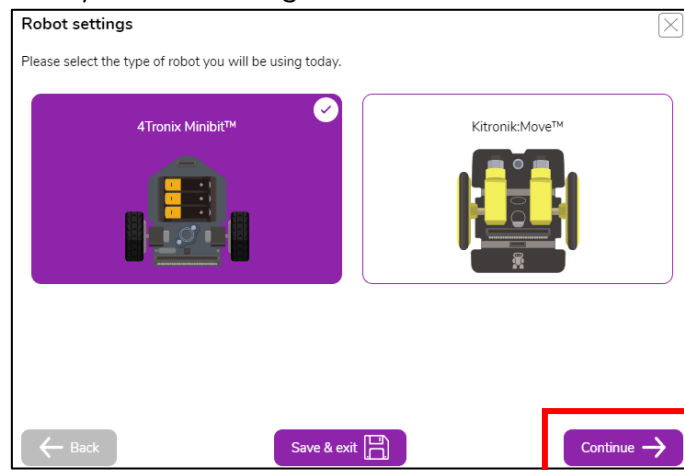


LogoBot is a way of controlling an external device on Purple Mash using Logo. LogoBot works with the BBC Microbit. This is used to control the MiniBit from 4tronix or the Kitronik:Move

Calibrating The Robot

The calibration is stored in the users Purple Mash account. For this reason it is recommended that where possible pupils use the same root each time.

1. Choose the type of robot you will be using – 4Tronix MiniBit or Kitronik:Move then press continue.



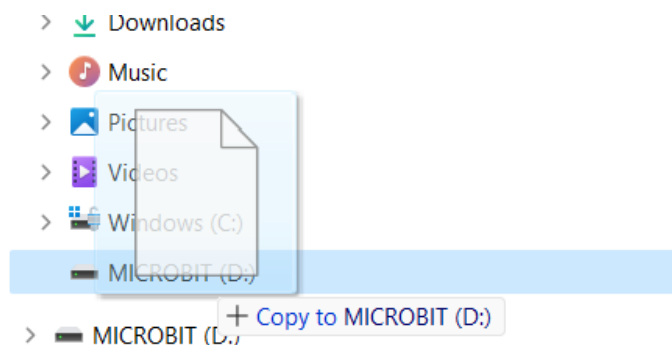
2. Read the information about calibration then press continue.

Due to variations in manufacturing your robot might not move forwards in a perfectly straight line or rotate by exactly the angles you specify.

The behaviour of your robot can also change depending on what surface you put it on (eg. a smooth table or rough carpet).

Click 'Continue' if you would like to continue and calibrate it now or click 'Save & exit' to save your choice of robot. You can always calibrate it later.

3. Turn the robot off and download the calibration file. On a PC this will normally go to your download folder. Drag the file 'Calibration.hex' into the device – in this case a MicroBit.



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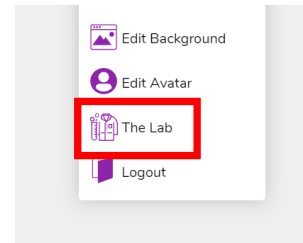
4. Plug your MicroBit into your robot and place your robot on the surface you intend to use - for example on a table or on the floor.
5. Follow the calibration guidance to successfully calibrate your device. Once it is calibrated then it is ready for use.

Getting Started

A complete list of instructions for LogoBot can be found [here](#). The MicroBit can also be programmed to output letters and numbers as well various symbols. A complete list of these can be found [here](#).

To transfer code from LogoBot to the robot is a simple task:

1. Open up LogoBot from the Lab area on Purple Mash. This can be found by clicking on the drop-down menu next to your name and avatar at the top right of Purple Mash.



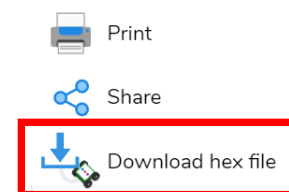
2. Click on the LogoBot icon to open a special version of Logo.



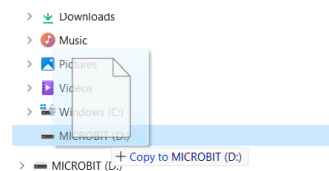
3. Type your instructions into LogoBot and then run the code by pressing on the PLAY button



4. Once you have run the code you can download the 'hex file by clicking on the burger menu in the top left of the screen and clicking on 'Download hex file'. This will save the file to your computer. On a PC this is normally your 'Downloads' folder.



5. Plug your MicroBit into the computer and drag the hex file from the computer to your device.



6. Turn your robot off and insert the MicroBit. Turn the robot on and the robot will follow the instructions you inputted into LogoBot.

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LogoBot Instructions

BK	Move backwards a distance of units	e.g. BK 5 = Moves the robot back 5 spaces
FD	Move forward a distance of units	e.g. FD 5 = Moves the robot forward 5 spaces
LT	Turn left a given number of degrees	e.g. LT 90 = Turns the robot left 90 °
RT	Turn right a given number of degrees	e.g. RT 90 = Turns the robot right 90 °
RPT	Repeat a set of instructions a number of times	e.g. REPEAT 4 = Repeats the instructions 4 times
WAIT	Pause actions for a number of seconds	e.g. WAIT 3 = Pauses the robot for 3 seconds
PD	Pen Down. Puts the pen down for drawing	e.g. PD
PU	Pen Up. Lifts the pen up and stop drawing	e.g. PU
SETPC	Set the pen colour on screen.	e.g. SETPC Red
SETPS	Sets the size of the pen on screen	e.g. SETPS 10
SAY	Display text or an emoji	e.g. SAY "hello_world, or SAY :IMAGE_HAPPY

For further information about using Logo please refer to the Logo Manual

LogoBot Emojis

:IMAGE_HAPPY		:IMAGE_TARGET	
:IMAGE_SAD		:IMAGE_BUTTERFLY	
:IMAGE_HEART		:IMAGE_SKULL	
:IMAGE_SMILE		:IMAGE_RABBIT	
:IMAGE_YES		:IMAGE_XMAS	
:IMAGE_NO		:IMAGE_HOUSE	
:IMAGE_TRIANGLE		:IMAGE_GHOST	
:IMAGE_DIAMOND		:IMAGE_SWORD	
:IMAGE_SQUARE		:IMAGE_UMBRELLA	

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Lesson 1 – Creating .hex files

Aims

- To understand that the MicroBit uses .hex files to receive instructions.
- To send .hex files to a MicroBit to alter the LED display.

Success Criteria

- Children can create a simple LogoBot program.
- Children can export a LogoBot program as a .hex file.
- Children can drag a .hex file into a MicroBit drive.

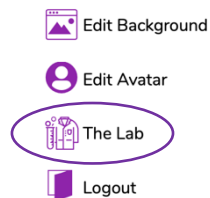
Resources and Preparation

- MicroBits, along with the connecting USB to MicroUSB cable, will be needed.
- Children will need to know the location of, and how to open, the Downloads folder on their device, as this is where a .hex file from LogoBot will be saved to.
- You may want children to create a folder – depending on how your network structure system is configured – into which their .hex files can be moved to.

Activities

Activity 1

1. Ensure that children have access to a MicroBit, and a connecting USB to MicroUSB cable.
2. Open a browser window, and sign into PurpleMash.
3. Click on the arrow to the right of the username in the top right of the window. From the options that appear, select 'The Lab'.

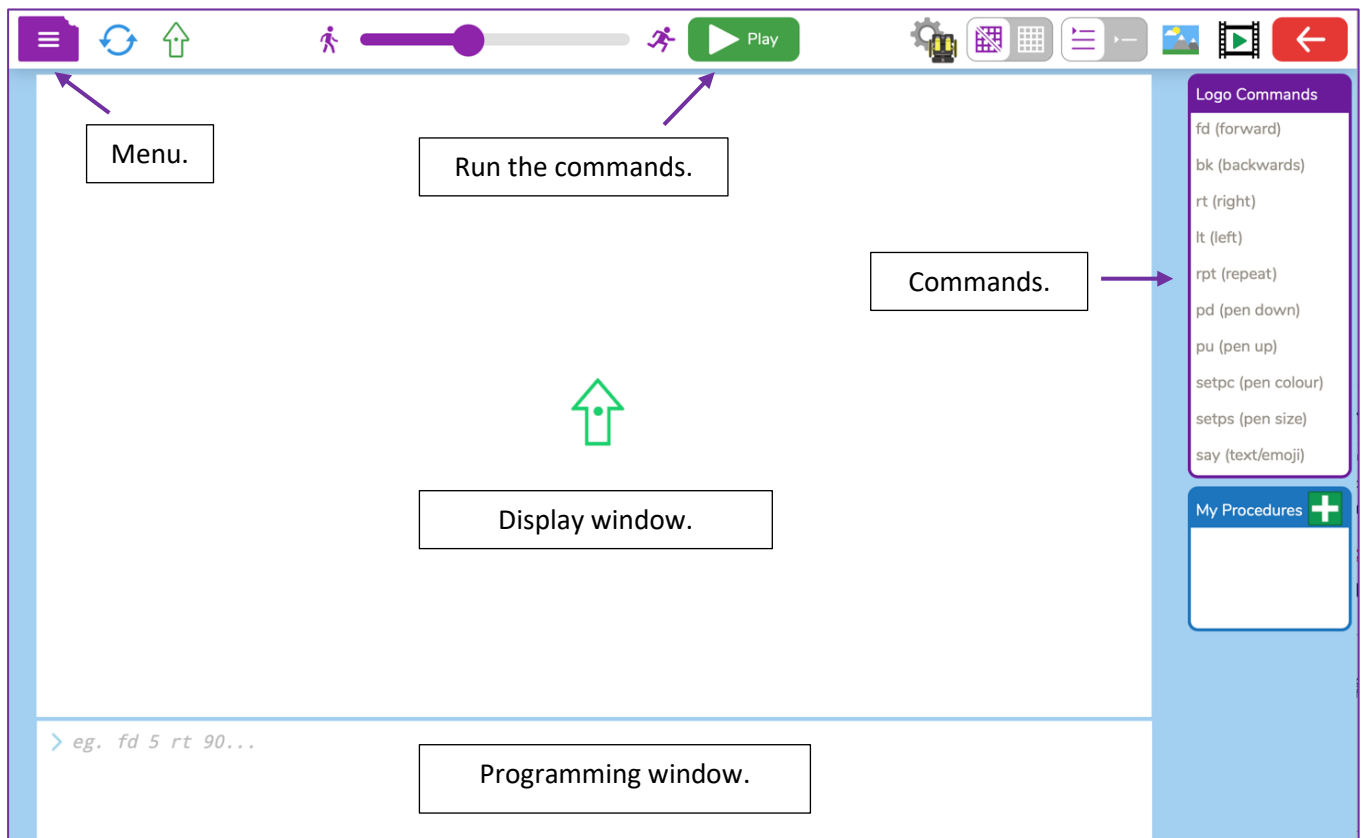



4. Click on the LogoBot icon within The Lab to open the app.
5. Previously in Year4, children may have used 'Logo' to control a turtle on screen. LogoBot provides additional functionality that allows an external device – like a MicroBit – to be programmed and controlled.
6. When LogoBot is opened a message will pop up on screen asking which type of robot is being used. There is no robot needed in this lesson, so click on the cross in the top right corner of the pop-up window to continue. The LogoBot program will open.
7. Point out the following features of LogoBot that will be used in the lesson:
 - the main window where the results of a program will be displayed.
 - a list of commands that can be used to in a program.
 - an area where commands can be entered to create a program.
 - the play button to run a program.

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- the menu from where a .hex file can be downloaded.



8. Ask children to examine their MicroBit. Discuss the features that they can see on it.
9. There are two buttons on the front of the MicroBit, and a display of 25 LEDs in a 5x5 grid. Explain that the LEDs can be used to display text or images. In this lesson children will create programs that will light up the LEDs.
10. Explain to children that to make text, or an image display on the LED grid a command must be written within LogoBot, then sent to the MicroBit.
11. Ask children to look at the right-hand side of the LogoBot screen at the commands available. Which command do they think would be used to display text or an image?
12. The **say** command is used.
13. Show the children how to make a tick appear on the MicroBit display. Ensure that they copy what you do.
14. In the programming window, type **say :image_yes**.
15. There is a space after **say** and, because we want to use an image to appear, the descriptor ':image_' is used. The word 'yes' tells the program that a tick will be shown.
16. A list of additional images that can be used is shown in the LogoBot guide.
17. When the command has been entered, click on the green 'Play' button at the top of the screen. In the top left corner of the display window, a small tick will appear, showing that the program has run.
18. To create a .hex file that can be sent to the MicroBit, click on the menu icon and click on  Download hex file

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19. A .hex file will be created and placed in the download folder of your device.
20. Open the download folder and rename the file to 'tick.hex'.
21. Children could create a new folder in their server space, and drag, or cut and paste, the hex file into the created folder. All future .hex files could be placed here.
22. Instruct children to connect the USB cable to the computer. Once done, insert the microUSB end of the cable into the top of the Microbit.
23. When connected, a drive icon labelled 'MICROBIT' will appear on the computer desktop.
24. Double click this to open the MicroBit drive. Two files should be present in the folder – leave both alone.
25. Click on and drag the 'tick.hex' file from the folder it is currently in to the MicroBit folder.
26. An orange light on the top of the MicroBit will flash to show that a program is being downloaded to the device. Once the program has downloaded, a tick will appear on the MicroBit LED display.

Activity 2

1. Tell children that they are going to create 5 more Binary (.hex) files. They will create an image of a cross using **say :image_no** then create programs to show the letters A – D.
2. Point out that when entering text, the command used is **say "A**. Note that there is space after 'SAY', and that a single speech mark is used as a descriptor to tell the program that text will follow.
3. Remind children to use the menu option to download each file to the download folder, rename it to make it easy to identify, then move it to their created folder where all Binary (.hex) files can be saved together.
4. Once children have created 6 files (Yes, No, A - D), a teacher quiz can be run using multiple choice and True / False questions.
5. Each question will require children to select a .hex file, drag it into the MicroBit drive then hold up the MicroBit to show their answer, displayed on the LED display.
6. ***Note that a .hex file can be dragged and dropped onto the MicroBit drive icon rather than opening the MicroBit drive folder for each question.***
7. Review the success criteria for the lesson. Children could rate how well they achieved this using a show of hands.

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Lesson 2 – AnagramBot

Aims

- To change the display on a MicroBit as required through the modification of a LogoBot program.
- To create and download .hex files to a MicroBit when required.

Success Criteria

- Children can modify a LogoBot program.
- Children can link numbers and words together to display a phrase.
- Children are able to use a .hex file to update the display of a MicroBit.

Resources and Preparation

- MicroBits, along with the connecting USB to MicroUSB cable, will be needed.
- Pupils will need to know the location of, and how to open, the Downloads folder on their device, as this is where a .hex file from LogoBot will be saved to.

Activities

Activity 1

1. Ensure that children have access to a MicroBit, and a connecting USB to MicroUSB cable.
2. Open a browser window, sign into PurpleMash and open LogoBot from 'The Lab' as done previously.
3. When LogoBot is opened a message will pop up on screen asking which type of robot is being used. There is no robot needed in this lesson, so click on the cross in the top right corner of the pop up window to continue. The LogoBot program will open.
4. Recap with children how to make a MicroBit display text. Remind them of the command used to display text ('SAY ') and that to display text a single speech mark is used before the text is written.
5. Challenge children to create a program using LogoBot that will make the MicroBit display their name.
6. Display the command **say "name** for those children who are struggling.
7. Ask children to run the program on screen, using the green play button, to test that their program works, before using the menu to download a .hex file to the Downloads folder and rename the .hex file.
8. Connect the MicroBit to the computer using the USB cable.
9. Discuss with children if they can remember how to download the .hex file to the MicroBit.
10. Click and drag on the created .hex file and drop it on to the MicroBit drive icon.
11. An orange light on the top of the MicroBit will begin to flash to show that a program is being downloaded to the device. Once the program has downloaded, text will appear on the MicroBit LED display. Note that because the text is longer than the width of the display, it scrolls across the display.
12. Return to the LogoBot program and challenge children to add their last name to the program.

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13. When they press play, they will notice an error message.

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14. The program does not understand what to do with the last name, as there is a space after the first name. To overcome this, an underscore (_) needs to be placed between separate words (or numbers) so that the **say** command includes them in the program.

```
> SAY "firstname_lastname|
```

15. Re-run the program, download the modified .hex file then drag it onto the MicroBit drive icon.
16. Ask children how they could modify their program so that the displayed words are shown more than once. Add a second and third line, repeating the instruction shown on the first line, to make the text scroll across the display more than once.

Activity 2

1. Explain that in this lesson a selection of 9 letters will be shown to the children. They will be challenged to make the longest word that they can from all, or some, of those letters. Once they have created their longest word, they will be creating a program using LogoBot that will make their MicroBit display how long their word is, and what that word is. Tell them that each 'round' of the game will be timed.
2. Display 9 letters; for example P – O – N – G – I – R – E – T – A and start a timer.
3. Once children have created the longest word from the letters shown, they need to modify their `firstname_lastname` LogoBot program to display the number of letters in their word, followed by an underscore and then their word, ensuring that it scrolls more than once;

```
> SAY "9_operating  
SAY "9_operating  
SAY "9_operating|
```

4. In the example above the text will scroll across the MicroBit display 3 times, as there are 3 'SAY' commands.
5. Children run the program to test that it works, then download the .hex file.
6. When the timer ends, children drag the .hex file into the MicroBit drive icon and hold up the device to show their answer.
7. Discuss answers, then repeat with additional sets of 9 letters.
8. Review the success criteria for the lesson. Children could rate how well they achieved this using a show of hands.

Lesson 3 – RoboTimer

Aims

- To write a program using LogoBot to make a MicroBit control a Robot.
- To use the repeat command in LogoBot to make an event occur multiple times.
- To use the wait command to pause between instructions.

Success Criteria

- Children can program multiple identical events using the repeat command.
- Children can create pauses within a program using the wait command.
- Children can use a MicroBit to control a robot.

Resources and Preparation

- MicroBits, and a compatible robot, along with the connecting USB to MicroUSB cable, will be needed.
- Pupils will need to know the location of, and how to open, the Downloads folder on their device, as this is where a .hex file from LogoBot will be saved to.

Activities

Activity 1


1. Ensure that children have access to a MicroBit, and either a 4Tronix MiniBit or a Kitronik:Move robot, and a connecting USB to MicroUSB cable.
2. Open a browser window, sign into PurpleMash and open LogoBot from 'The Lab' as they have done previously.
3. When LogoBot is opened a message will pop up on screen asking which type of robot is being used. Select the robot you are using from the choices provided. An option to calibrate the robot is then provided. If you wish to calibrate the robot, ensure that the MicroBit has been connected to the robot, and that the MicroBit cable is connected to your computer. Click on 'continue' and follow the instructions provided. Full instructions on calibrating the robot are provided in at the start of the guide. If you do not wish to calibrate the robot, click on 'Save and Exit'.
4. Ask children to look at the commands on the right of the browser window. Which commands would make the robot move? (**fd** and **bk** will provide movement, **lt** and **rt** will alter the robot's direction)
5. Challenge children to make a short program that would move a robot 1 unit forward, and then 1 unit backwards.

```
> fd 1 bk 1|
```

6. Ask children to run the program on screen, using the green play button, to test that their program works. The green arrow should move forward once and backwards once.
7. Recap lesson 2, where children wrote out instructions several times to make text display more than once on the MicroBit. Ask children to look at the commands on the right of the screen and see if there is a command that could be used to avoid typing out instructions multiple times.

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- The repeat command can be used to an event happen more than once.
- Explain that the **rpt** command uses square brackets to tell LogoBot what to repeat, for example if you typed **rpt 3 [SAY "firstname_lastname]** it would display the text "firstname_lastname" three times.
- Ask children to clear the screen. This can be achieved by clicking on the refresh icon. 

Activity 2

- Challenge children to use the repeat command to make their on-screen turtle move forwards 3 spaces and backwards 3 spaces 5 times, using just one command line of instructions, then test their program by clicking on the green play button.

```
> rpt 5 [fd 5 bk 5]
```

- Once children have made their on-screen turtle move forward and backwards several times, using the repeat command, they open the menu and download the .hex file.
- Make sure that the MicroBit is connected to the computer, and switch on the robot.
- Drag the .hex file created onto the MicroBit drive icon.
- An orange light on the top of the MicroBit will begin to flash to show that a program is being downloaded to the device. Once the program has downloaded, the robot will begin to move forwards and backwards and repeat the actions several times.
- Return to the LogoBot program and refresh the screen.
- Ask children how they could make the robot turn around in a complete circle. Knowledge of degrees will be helpful here.

Activity 3

- Challenge children to use the **rpt** and **rt** commands to make their robot spin around.

```
> rpt 360 [rt 1]
```

- As there are 360° in a circle, making a 1° right turn 360 times will make the robot spin around completely.
 - Download the .hex file and time how long it takes the robot to make a complete turn.
 - Ask children to look at the commands on the right of the LogoBot screen and identify a command that could be used to make the robot take longer to rotate. The **wait** command can be used.
 - Modify the program currently shown on screen by adding a **wait 1** command in the repeat block before the **rt 1** command.
- ```
> rpt 360 [wait 1 |rt 1]
```
- Ask children to predict what this will do to the program when it is run.
  - Click on play and see if the predictions were correct. The robot should pause briefly after each 1° turn.
  - Download the .hex file to the MicroBit, and time how long it takes the robot to make a complete turn now.

## Activity 4

- Challenge children to create a program in LogoBot that can be used as a timer for a set amount of time.

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2. Ask children how they could include a way of knowing that the timer has ended (this could be achieved by adding a 'SAY' command with text that scrolls across the display, as it will also read out the text giving an audio indication that the timer has ended).
3. Review the success criteria for the lesson. Children could rate how well they achieved this using a show of hands.

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# Lesson 4 – SignWriter

## Aims

- To use forward and backwards commands with various distances to create 3D letters.
- To use angle degrees to make the robot turn specific amounts.

## Success Criteria


- Children can use various commands and values to make their robot move a desired distance.
- Children can use a suitable angle to make their robot turn a required number of degrees.
- Children can use the repeat, forward and turn commands to make their robot create a curved line.

## Resources and Preparation

- MicroBits, and a compatible robot, along with the connecting USB to MicroUSB cable, will be needed.
- Pupils will need to know the location of, and how to open, the Downloads folder on their device, as this is where a .hex file from LogoBot will be saved to.

## Activities

### Activity 1

1. Ensure that children have access to a MicroBit, and either a 4Tronix MiniBit or a Kitronik:Move robot, and a connecting USB to MicroUSB cable.
2. Open a browser window, sign into PurpleMash and open LogoBot from 'The Lab' as done previously.
3. If children are using the same robot on the same computer as in lesson 3, calibration of the robot will not be required. However, if children use a different robot or computer, re-calibration may be required. Full instructions about how to calibrate the robot are given at the start of the guide.
4. Ask children to create a simple letter 'L' using the commands in LogoBot. They will need to consider how many degrees to turn the on-screen turtle, and how far to move for each part of the letter. The display grid option may help with calculating distances in this task – it can be turned on using the grid  icon at the top of the screen.

5. Once they have completed the task and run it to check, display a solution for them to see and discuss.

```
fd 5 bk 5 rt 90 fd 3
```

6. Ask children how a 3D letter 'L' would look and challenge them to create it. The letter should be 5 blocks high. (A possible solution is shown at the end of this lesson).
7. Remind children to use the refresh button to clear their screen before they run their modified program.
8. Place the robot on a large sheet of paper (A3 is ideal) and insert a pen into the pen hole in the centre of the robot chassis.
9. Download the .hex file to the MicroBit and turn the robot on. The 3D letter will be drawn on the sheet of paper.

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### Activity 2

1. Challenge children to write programs in LogoBot to create straight edged 3D letters such as 'E' and 'H'. (Possible solutions for these letters are shown at the end of this lesson).

### Activity 3

1. Tell children that their next challenge is to create 3D letters for 'O' and 'G'.
2. To create a 3D 'O' will require drawing two circles – one inside the other – using the repeat, forward and right / left commands. Note that only a small distance to move is needed, using a value less than 1 is suggested.
3. Remind children that a complete circle has 360°. This may help them with the repeat value.
4. The 3D letter 'G' is created using half a circle and modifying the top and bottom. (Possible solutions are shown at the end of this lesson).
5. Allow time for children to create and modify their program.
6. Display, or hand out, solutions to the 3D letters challenge then introduce the final activity.

### Activity 4

1. Challenge children to create a program that would write the word 'LOGO' on screen. Explain to children that they will also have to consider how to move the robot to a new location after each letter has been drawn.



2. As an option, once completed, the .hex file is downloaded to the MicroBit, and the robot placed on a large sheet of paper, where the word is written out.
3. Review the success criteria for the lesson. Children could rate how well they achieved this using a show of hands.



## Letter Writing Solutions

|   |                                                                                                                                        |  |
|---|----------------------------------------------------------------------------------------------------------------------------------------|--|
| L | fd 5 rt 90 fd 1 rt 90 fd 4 lt 90 fd 2 rt 90 fd 1 rt 90 fd 3 rt 90                                                                      |  |
| E | fd 5 rt 90 fd 3 rt 90 fd 1 rt 90 fd 2 lt 90 fd 1 lt 90 fd 2 rt 90<br>fd 1 rt 90 fd 2 lt 90 fd 1 lt 90 fd 2 rt 90 fd 1 rt 90 fd 3 rt 90 |  |
| H | fd 5 rt 90 fd 1 rt 90 fd 2 lt 90 fd 1 lt 90 fd 2 rt 90 fd 1 rt 90<br>fd 5 rt 90 fd 1 rt 90 fd 2 lt 90 fd 1 lt 90 fd 2 rt 90 fd 1 rt 90 |  |

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|   |                                                                                                                                           |                                                                                     |
|---|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| O | <p>lt 90 rpt 180 [ rt 2 fd 0.1 ] rt 90 fd 1 lt 90<br/> rpt 180 [ rt 2 fd 0.066 ] lt 90 fd 1 rt 180</p>                                    |  |
| G | <p>lt 90 fd 1 rpt 90 [ rt 2 fd 0.1 ] fd 1 rt 90 fd 1 rt 90 fd 1<br/> rpt 90 [ lt 2 fd 0.065 ] lt 90 fd 1 rt 90 fd 1 rt 90 fd 2 rt 180</p> |  |

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# Lesson 5 – MazeRunner

## Aims

- To create a LogoBot program to simulate moving about a maze.
- To test and modify a program to successfully navigate a floor maze.

## Success Criteria

- Children can adapt, amend and modify a program in order to achieve a desired outcome.




## Resources and Preparation

- MicroBits, and a compatible robot, along with the connecting USB to MicroUSB cable, will be needed.
- Pupils will need to know the location of, and how to open, the Downloads folder on their device, as this is where a .hex file from LogoBot will be saved to.
- The 'MazeRunner' LogoBot file, set as a 2Do for children to open.
- A floor based maze will be required. This will be 4m x 4m, divided up into 25cmx25cm squares using chalk or tape, and labelled with the same features as shown on the 'MazeRunner' maze.

## Activities


### Activity 1

1. Ensure that children have access to a MicroBit, and either a 4Tronix MiniBit or a Kitronik:Move robot, and a connecting USB to MicroUSB cable.
2. Open a browser window, sign into PurpleMash and open LogoBot from 'The Lab' as done previously.
3. If children are using the same robot on the same computer as in previous lessons, calibration of the robot will not be required. However, if children use a different robot or computer, re-calibration may be required. Full instructions about how to calibrate the robot are given at the start of the guide.
4. Explain to children that they are going to create a LogoBot program that will guide their robot around a floor maze, avoiding obstacles, whilst performing actions. Tell them that they will begin by using the LogoBot app to create and modify their program, testing it and amending it until they can successfully navigate the maze.
5. Children open the MazeRunner file previously set as a 2Do.
6. The challenge of MazeRunner is to visit each of the four icons (clock / ghost / tick and butterfly), stop on the icon and perform a particular action.

|       |                                         |                                                                                       |
|-------|-----------------------------------------|---------------------------------------------------------------------------------------|
| Clock | Pause the robot for 5 seconds           |  |
| Ghost | Display a ghost on the MicroBit display |  |
| Tick  | Display a tick on the MicroBit display  |  |

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|           |                                             |                                                                                     |
|-----------|---------------------------------------------|-------------------------------------------------------------------------------------|
| Butterfly | Display a butterfly on the MicroBit display |  |
|-----------|---------------------------------------------|-------------------------------------------------------------------------------------|

7. At the ghost / tick and butterfly icons, the MicroBit must display the image shown in the table above. When the MicroBit reaches the clock icon, it must pause for 5 seconds.
8. Black lines cannot be crossed. The stars will be explained when the floor maze is used.
9. Encourage children to plan their instructions on paper, before entering the instructions.
10. Remind them to run the simulation frequently, using the refresh button to reset the on-screen turtle each time. Discuss the importance of regular saving, as they develop their program.

### Activity 2

1. Once children have created their MazeRunner program, they download to their computer as a .hex file and then place in the MicroBit drive icon on their desktop.
2. On the floor maze, place upside down paper cups over the star icons. Place a marble on each cup. If any robots run into a cup, the marble will be knocked off indicating contact.
3. Children place their robot on the start point of the floor maze and switch it on. This will cause the downloaded program to run. Note that if the program does not run, the reset button (to the right of the USB connector) when pressed will re-start the program.
4. Review the success criteria for the lesson. Children could rate how well they achieved this using a show of hands.

# Lesson 6 – Dance, Robot, Dance

## Aims

- To build and use procedures in LogoBot.

## Success Criteria

- Children can use the procedure command.
- Children can create a dance routine for a robot using LogBot.

## Resources and Preparation

- MicroBits, and a compatible robot, along with the connecting USB to MicroUSB cable, will be needed.
- Pupils will need to know the location of, and how to open, the Downloads folder on their device, as this is where a .hex file from LogoBot will be saved to.
- Range of 'DanceMove' cards (optional)

## Activities

### Activity1

1. Ensure that children have access to a MicroBit, and either a 4Tronix MiniBit or a Kitronik:Move robot, and a connecting USB to MicroUSB cable.
2. Open a browser window, sign into PurpleMash and open LogoBot from 'The Lab' as shown in lesson 1.
3. If children are using the same robot on the same computer as in previous lessons, calibration of the robot will not be required. However, if children use a different robot or computer, re-calibration may be required. Full instructions about how to calibrate the robot are given in the guide.
4. Explain to children that they are going to create a LogoBot program that will create a dance routine for the robot using the least amount of instructions possible.
5. Ask children to create a simple set of commands in LogoBot that will make their on-screen turtle turn to the right, then turn to the left, then return to looking straight ahead. At this point, there is no need to use forward or backwards commands, the turtle is only being asked to change direction.
6. Children edit and test their commands to ensure that the on-screen turtle performs the actions required.

```
> rt 45 lt 90 rt 45
```

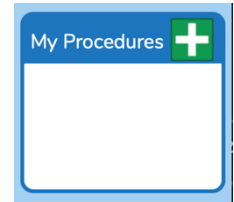
7. Ask children what command they could add to their instructions so that the on-screen turtle keeps on performing the same actions several times. If necessary, recap previous work from lesson 3 on **repeat**.
8. Children modify their instructions to include a repeat command allowing the instructions to loop several times.

```
> rpt 5 [rt 45 lt 90 rt 45]
```

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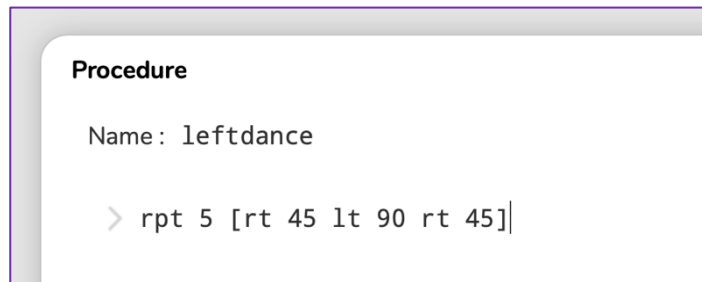
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9. Introduce the 'My Procedures' area on the right of the LogoBot screen. Explain that a procedure is a way of saving a series of instructions so that they can be used more than once in a program without the need to type of all of the instructions again and again.



10. Model with children how to create a procedure. Click on the plus sign in the green box to the right of 'My Procedures'. A pop-up window will appear, asking for a name for the procedure being created.

11. Call it 'leftdance'. Type in the same instructions as had been entered in the programming window before.



12. Once the instructions have been entered, click on the green 'OK' button at the bottom of the pop-up window. The 'My Procedures section now contains a procedure that is called 'leftdance'.

13. Remove the instructions that are shown in the programming window, and then click once on the 'leftdance' procedure text in the Procedures box.

14. The text appears in the programming window. Click on the 'Play' button and see how the on-screen turtle performs the same actions as before.

15. Although only 'leftdance' is shown in the programming window, LogoBot knows that it refers to a procedure, and runs all the instructions within that procedure.

### Activity2

1. Challenge children to create a procedure called 'rightdance' that will be the mirror of 'leftdance'. Once the procedure has been created children add it to programming window to make the on-screen turtle perform two dance moves.
2. Show a list of additional 'dance moves' for the on-screen turtle to perform.
3. Allow time for children to create additional procedures. These procedures will involve moving forwards / backwards, pausing, spinning around, or even displaying messages or images using the **say** command.

### Activity3

1. Once children have created a range of procedures, challenge them to create a dance routine for their robot.
2. A series of dance routine could be displayed using the optional 'DanceMove' cards shown below, or children are given free choice to create their own dance routines.
3. Ask children how their robot could perform the same actions for several 'verses' using the fewest amount of instructions (solution: place the procedures inside a repeat command).

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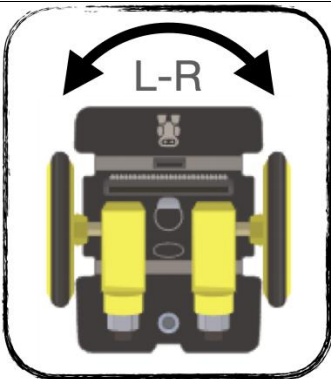
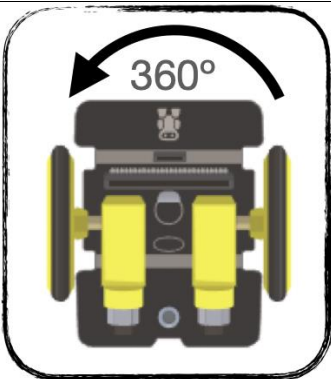
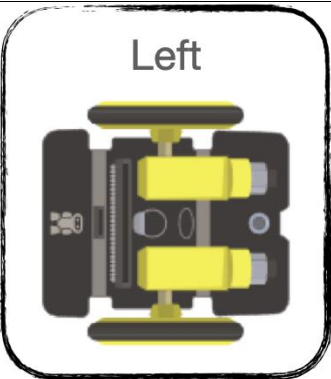


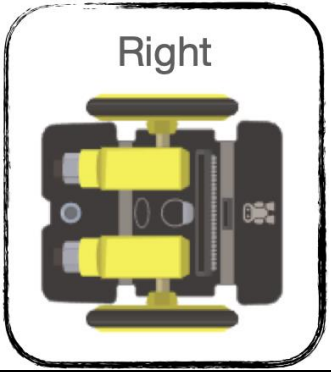
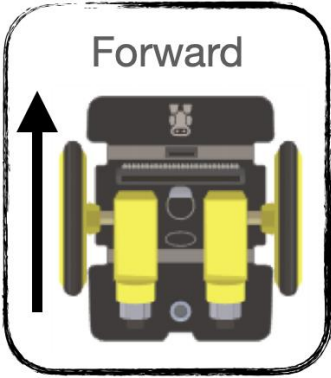
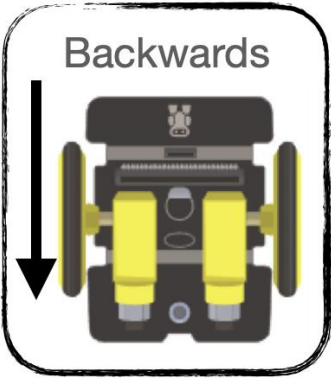
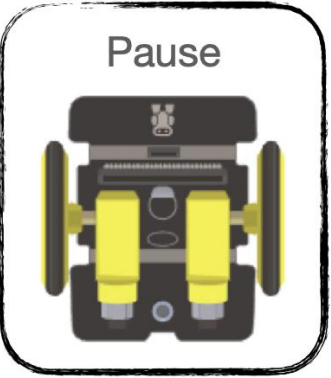
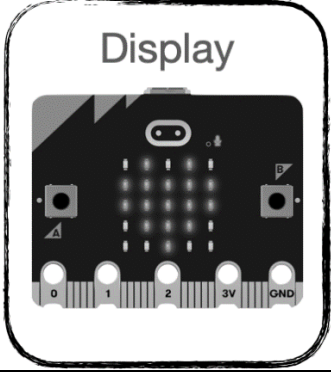
4. After the programmes have been tested on-screen, modified, checked and saved, children to download to their robot as .hex file allowing their robot to dance.
5. Review the success criteria for the lesson. Children could rate how well they achieved this using a show of hands.

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# Dance Routine Cards

|                                                                                     |                                                                                     |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|    |    |    |
|   |   |   |
|  |  |  |
|                                                                                     |  |                                                                                       |

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