

ROBOT GAMES (LEVEL 1)

Description	Learners will the basic concepts of programming such as sequencing and repetition. They will then apply the concepts to solve challenges on a maze.
Leading Question	How can you code a robot to perform activities and win puzzles?
Total Time Required	1 hour and 15 mins a day for 5 days
Supplies Required	Paper, pen, pencils, small toys
Learning Outcomes	<ul style="list-style-type: none"> ○ Logical thinking and problem solving ○ Problem solving
Previous Learning	None

DAY 1: SEQUENCING

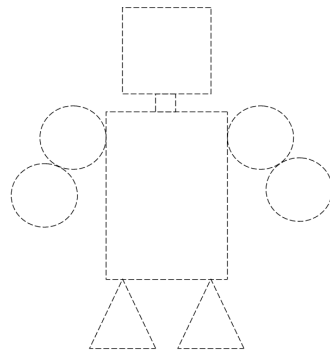
Today you will be learning about steps and creating instructions.

Suggested Duration	Activity and Description
15 minutes	<ul style="list-style-type: none"> ● Learners will be asked if they know how computers and phones work. Explain to the learner that most electronics and programs work by following code – a series of exact instructions, that are followed step-by-step. ● Use walking to explain code: in order to walk forward, ask them what are the steps? <i>Explain that in order to walk, they need to follow the following steps:</i> <ul style="list-style-type: none"> ○ Lift one foot, ○ Move that foot forward ○ Place their foot down ○ Lift their other foot, ○ Move it forward,

- Place the other foot down
- Ask the learner what happens when they miss a step? They get stuck or fall – the same thing happens with code!
- Ask the learner to try break down another regular task: picking up something, turning a page, etc. *Try to break down the steps to another task, such as a popular dance routine; for example, the Hokey Pokey needs the following steps:*
 - Put right foot in,
 - Pull right foot back,
 - Put right foot in,
 - Shake right foot around,
 - Put right foot out,
 - Do the hokey pokey
 - Turn around in a circle.
- Explain that they will be learning to program their own robot and using it to solve puzzles!

15 minutes

- Ask the learner if they've seen any robots recently – ask them to list some of the features of a robot they know of.
- Next, get the learner to design and draw their own robot – they can decorate their robot as they like



- **Numeracy activity:** As a first draft of their robot, have the learner sketch out a design using shapes that they already know of – shown on the left.

- Tip: The robots they design can be as simple as a box that they decorate, cubes stacked on top of each other or a 2D cutout (see Appendix 2 for sample robots).

- Learners will now create a grid of 5 by 5 squares, an example attached below – (a sample is

is attached under Appendix 1). The grid has to be large enough to accommodate the robot to stand in a single space

- Additionally, cut out 2 or 3 other squares and mark them differently (using either different colored paper or coloring them)
- Pick one square to be a start square, draw a green arrow on it
- Pick another square to be the end and draw a red circle on it
- Place an object or a toy as a “prize” on any square or use a colored square

- Tip: You could also use any existing space: tiles on the floor or mark out a space in sand/mud and mark the start/end square with a different colored paper/toy
- Here is an example of what a set up could look like this:



- Explain to the learner that they have to list all of the commands to:
 - Move from the start
 - Pick up the object
 - Move to the finish
- For their first try, help the learner “code” by making a list of the commands.
- For the sample set up, the code will could be:
 - Start
 - Move forward
 - Move forward
 - Turn right
 - Move forward
 - Move forward
 - Pick up toy
 - Move forward
 - Move forward
 - Turn right
 - Move forward
 - End
- Have the learner try different versions of the code – if their robot falls out of the grid, they’ve “broken” the code

20 minutes

- Move the prize around and have the learner write code to reach the end point to reach and pick up the toy

DAY 2: COUNTING

Today the learner will be taught to shorten code by learning repeating functions

Suggested Duration	Activity and Description																										
15 minutes	<ul style="list-style-type: none"> ● Literacy activity: Have the learner think about the different tasks that are already done by robots and how they make their lives easier – what tasks would the learner like to have a robot do for them? 																										
10 minutes	<ul style="list-style-type: none"> ● Ask the learner what they realized about the coding activity yesterday ● Ask if they realized that they had to repeat a number steps several times? ● Explain the concept of “counting” in code: that a code can be repeated for a set number of times. Example: move forward for 2 steps 																										
20 minutes	<ul style="list-style-type: none"> ● Use the example set up (from the previous day) and explain that counting could accomplish the same goal <table border="1" data-bbox="565 905 1414 1367"> <thead> <tr> <th>Original code:</th> <th>New Code:</th> </tr> </thead> <tbody> <tr> <td>● Start</td> <td>● Start</td> </tr> <tr> <td>● Move forward</td> <td>● Repeat 2 times: move forward</td> </tr> <tr> <td>● Move forward</td> <td>● Turn right</td> </tr> <tr> <td>● Turn right</td> <td>● Repeat 2 times: move forward</td> </tr> <tr> <td>● Move forward</td> <td>● Pick up toy</td> </tr> <tr> <td>● Move forward</td> <td>● Repeat 2 times: move forward</td> </tr> <tr> <td>● Pick up toy</td> <td>● Turn right</td> </tr> <tr> <td>● Move forward</td> <td>● Move forward</td> </tr> <tr> <td>● Move forward</td> <td>● End</td> </tr> <tr> <td>● Turn right</td> <td></td> </tr> <tr> <td>● Move forward</td> <td></td> </tr> <tr> <td>● End</td> <td></td> </tr> </tbody> </table>	Original code:	New Code:	● Start	● Start	● Move forward	● Repeat 2 times: move forward	● Move forward	● Turn right	● Turn right	● Repeat 2 times: move forward	● Move forward	● Pick up toy	● Move forward	● Repeat 2 times: move forward	● Pick up toy	● Turn right	● Move forward	● Move forward	● Move forward	● End	● Turn right		● Move forward		● End	
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30 minutes	<ul style="list-style-type: none"> ● Set up the grid with the prize in any chosen square and have the learner go from start to finish while picking up the prize. 																										

DAY 3: FUNCTION

Today the learner will be encouraged to improve their robot by creating their own functions.

Suggested Duration	Activity and Description
15 minutes	<ul style="list-style-type: none"> ● Explain that a function is a group of code, so for example:

	<ul style="list-style-type: none"> ● Walk: <ul style="list-style-type: none"> ○ Lift one foot, ○ Move that foot forward ○ Place their foot down ○ Lift their other foot, ○ Move it forward, ○ Place the other foot down ● So now, every time you need the robot to move, you can use the Walk function, instead of writing 7 lines of code – which makes it easier to code!
15 minutes	<ul style="list-style-type: none"> ● Ask the learner to come up with their own functions for their robot navigate the grid ● <i>Encourage them to think of functions that would help them navigate the grid faster, such as “Jump 2” or “Turn Around” – let them get creative!</i>
30 minutes	<ul style="list-style-type: none"> ● Set up the grid again and have the learners use their own functions to pick up the prize and navigate the grid
15 minutes	<ul style="list-style-type: none"> ● Literacy activity: Have the learner make a list of the activities they perform in their daily lives. Can they convert those activities into functions?

DAY 4: NEW OBSTACLES

Today the learner will be given new obstacles to code for

Suggested Duration	Activity and Description
10 minutes	<ul style="list-style-type: none"> ● Introduce new obstacles to the grid such as walls or holes or cracks that would affect the movement of robot around the grid ● <i>Tip: The grid can be expanded in size to accommodate more obstacles.</i>
15 minutes	<ul style="list-style-type: none"> ● Work with the learner to decide on what new functions they would need to navigate and help them create new functions
35 minutes	<ul style="list-style-type: none"> ● Reset the grid with the new obstacles and the prize and have the learner navigate the code, make it an obstacle course they have to solve. ● For every time the learner gets the code right, either increase the number of prizes or obstacles to make the levels harder

DAY 5: MISSION: ROBOT

Today the learner will use their new coding skills to create a story and a mission for their robot to complete

Suggested Duration	Activity and Description
10 minutes	<ul style="list-style-type: none"> • Together with the learner, create a story around the robot having to solve a mission. • For example: <ul style="list-style-type: none"> ○ The grid contains items causing pollution, such as trash, plastic bags, etc which need to be picked up to clean up the space. ○ The learner creates a mission to find a gem/key – they need to find the object (which can be hidden under an obstacle) in order to open/unlock another obstacle and get to the end, etc
5 minutes	<ul style="list-style-type: none"> • Help the learner design and set up their own obstacles/prizes/boosters • These can include: <ul style="list-style-type: none"> ○ small boxes to hide prizes under ○ A booster could special function that helps them overcome the grid (such as “break rocks”, “melt obstacle”, etc.
45 minutes	<ul style="list-style-type: none"> • Without the learner looking, set up the grid including the new obstacles, prizes and boosters • Have the learner write the code to solve the mission and keep track of the different attempts. <i>This might take several tries</i> • Once they have successfully solved the mission, have them build a story around the mission, including how they had to restart the mission, what new boosters they found on the way, etc

ASSESSMENT CRITERIA

Short and clear code is the main assessment. Once the learner has understood functions, assess how “efficient”, their code is – the more functions they develop, the shorter their code (in length) should be in order to achieve their goal.

MODIFICATION FOR SIMPLIFICATION

The learners can convert the whole project into a game where they are the robot themselves – making it one where physical activity is encouraged. They can then play the grid, where they jump over obstacles.

APPENDIX 1 – SAMPLE GRID

APPENDIX 2 – SAMPLE ROBOTS

