

PROJECT BOOKLET FOR CODING CURRICULUM

GRADE VI

Volume 1.0



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GETTING STARTED WITH BLOCK CODING

Chapter: Algorithms with Block Coding

Problem Statement: It's a common practice to display a hello message when we start to learn to code. Let us learn on how to display a “Hello World” message using Microsoft MakeCode.

Learning Outcome:

- You will learn how to run your first program using block coding in MakeCode
- Get familiar with MakeCode arcade platform

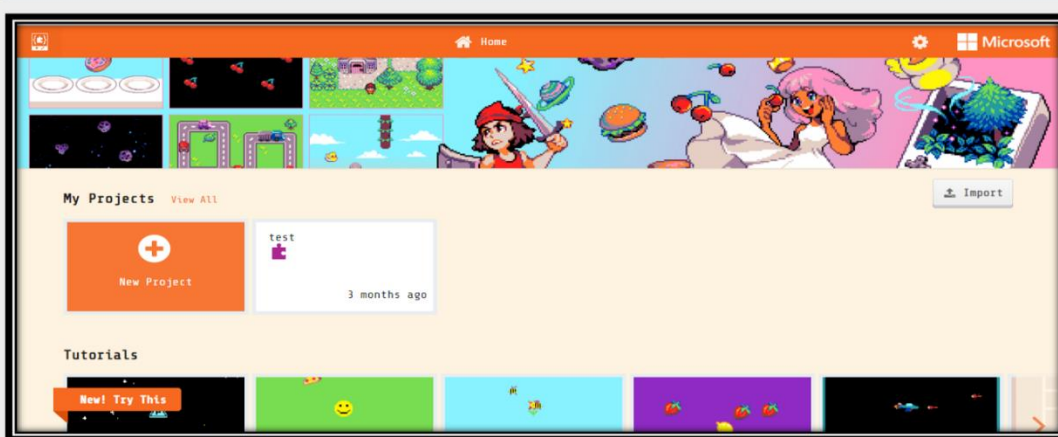
Solution:

Microsoft MakeCode is a framework for creating interactive and engaging programming experiences for those new to the world of programming.

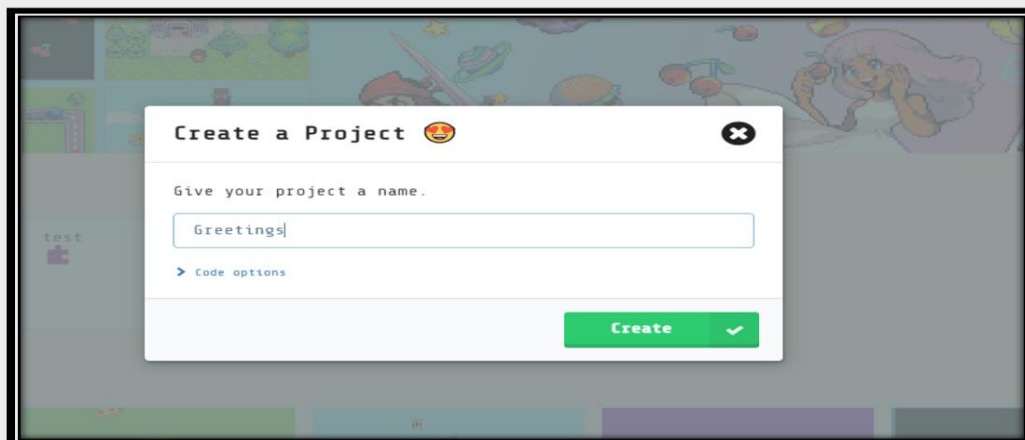
MakeCode Arcade is one of the platforms to perform block-based programming.

Using arcade, solution to a problem statement can be implemented using various categories of blocks and the results can be seen side by side on the same screen.

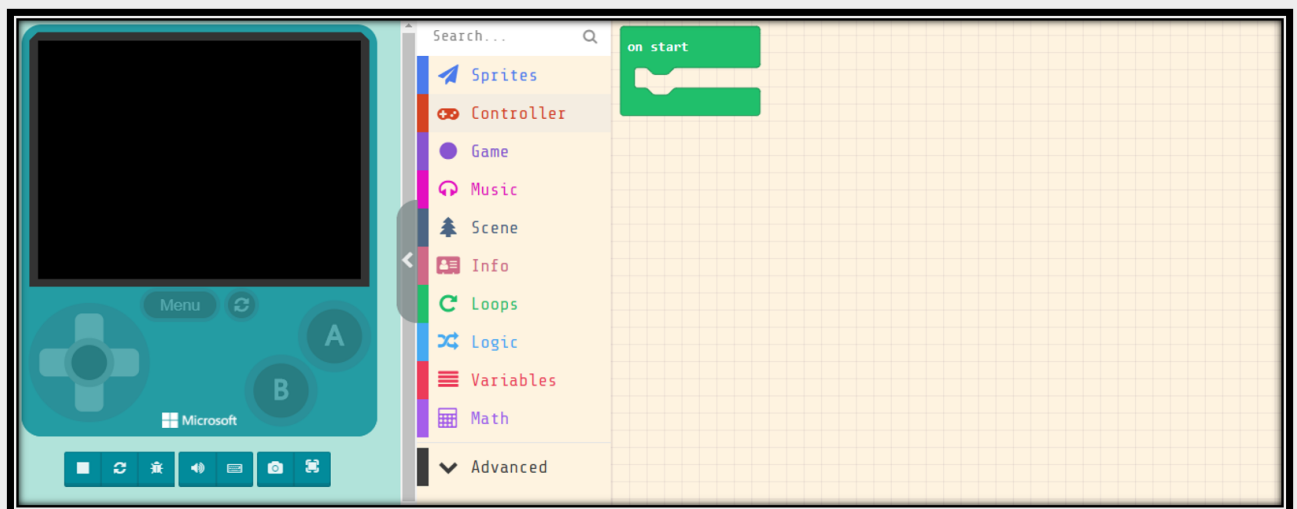
Open the URL <https://arcade.makecode.com> in your favorite web browser.



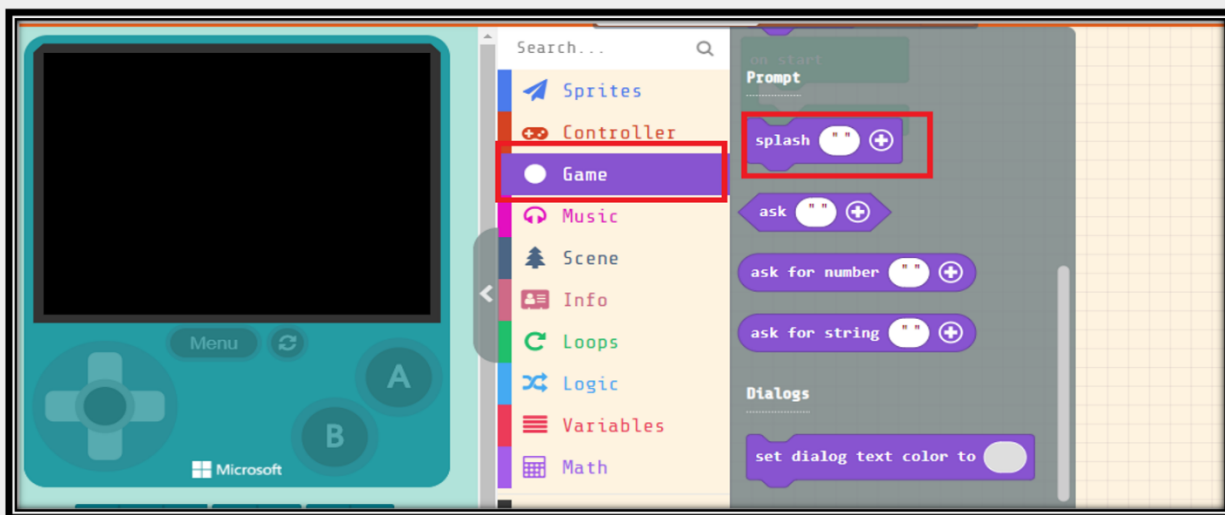
Step 1: Make code arcade home screen



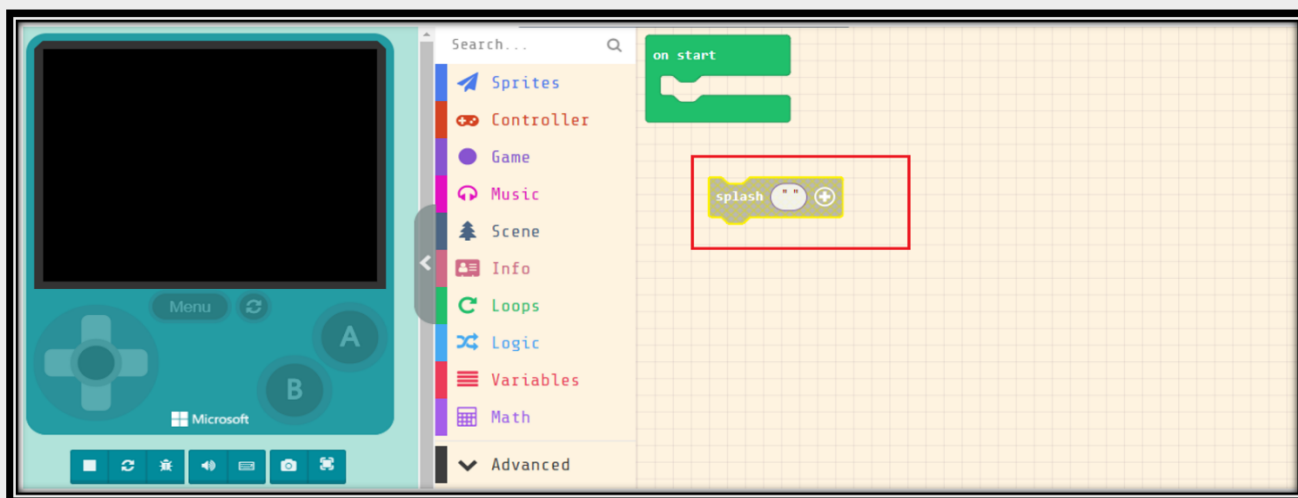
Step 2: Click on new project and name it “Greetings”



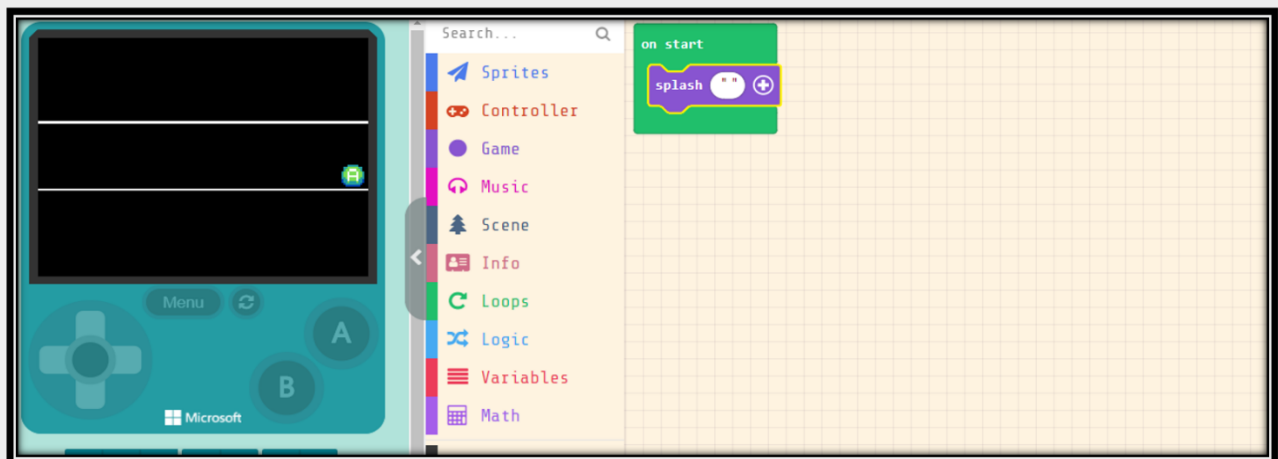
Step 3: A new screen is opened. The screen like structure on the left, is the place where results from a program output gets **displayed**. The list in the middle represents the different **block types** that are available. The space on the right having a block named “on start” is the place where we join different blocks to **execute** a set of steps.



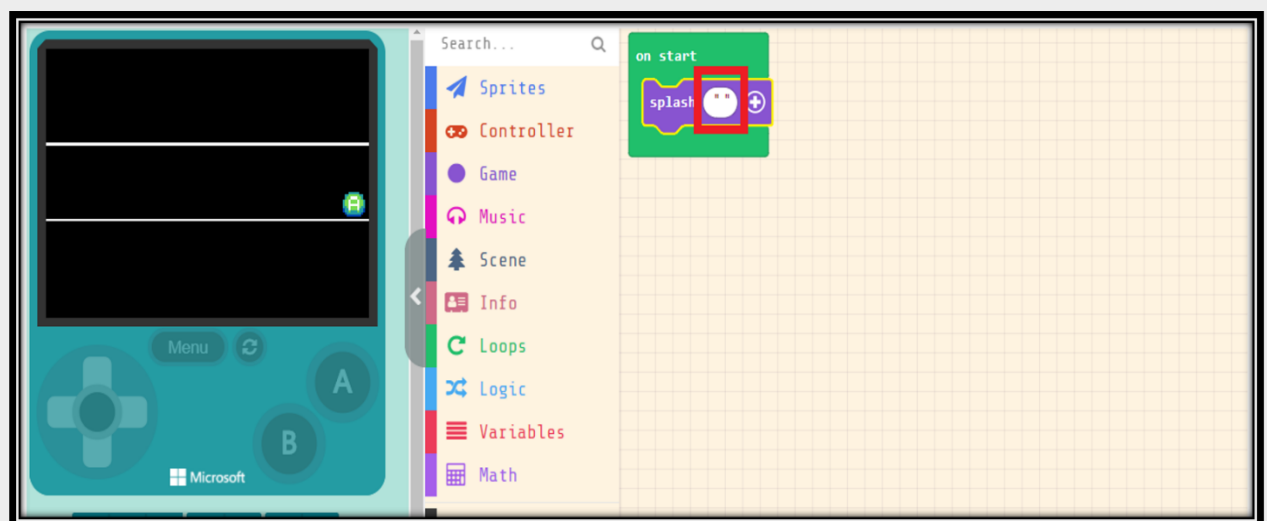
Step 4: Go to block type “**Game**” and select the block as highlighted in the diagram.



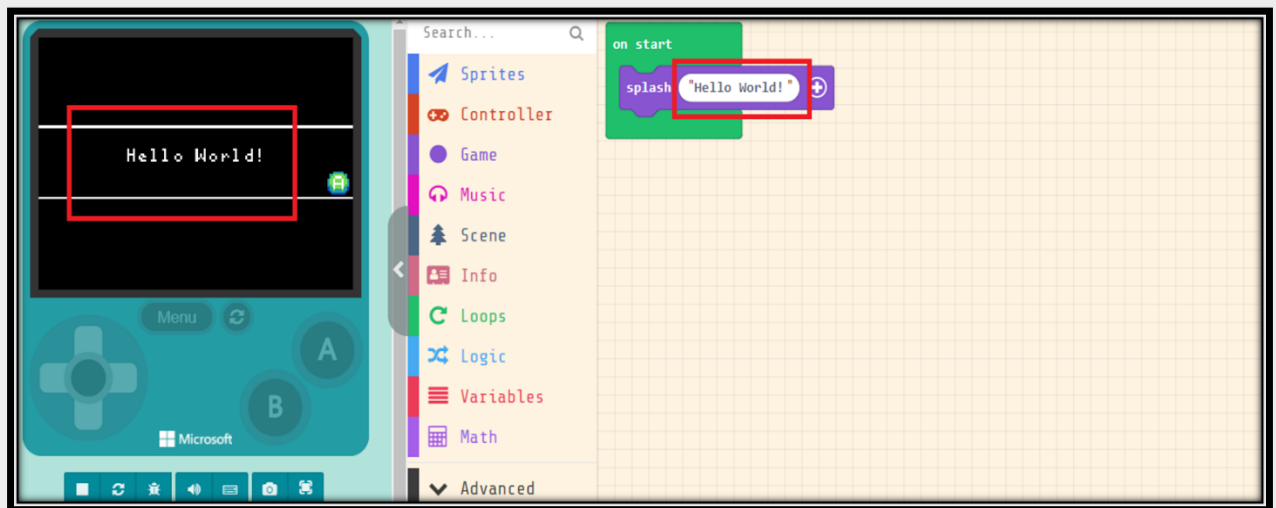
Step 5: A separate block gets created in the right-hand side as highlighted inside red lines shown



Step 6: Drag and drop the above block inside the “**on start**” block.
As soon as the splash block is placed inside “**on start**” block, the display on the left-hand screen changes.



Step 7: Left click the mouse inside the area highlighted using red lines.



Step 8: Type “Hello World!” inside the box where cursor is placed. The screen on the left automatically gets updated with the message - **Hello World!**

Congratulations, you have created your first block code program!

ADDITION USING BLOCK CODING

Chapter: Variables using block coding

Problem Statement: Using different mathematical functions is very important when learning how to code. In this activity we will learn how to implement addition operation using block coding.

Learning Outcome:

- You will learn on how to use a mathematical operator in block coding
- You will learn how to use functions and variables

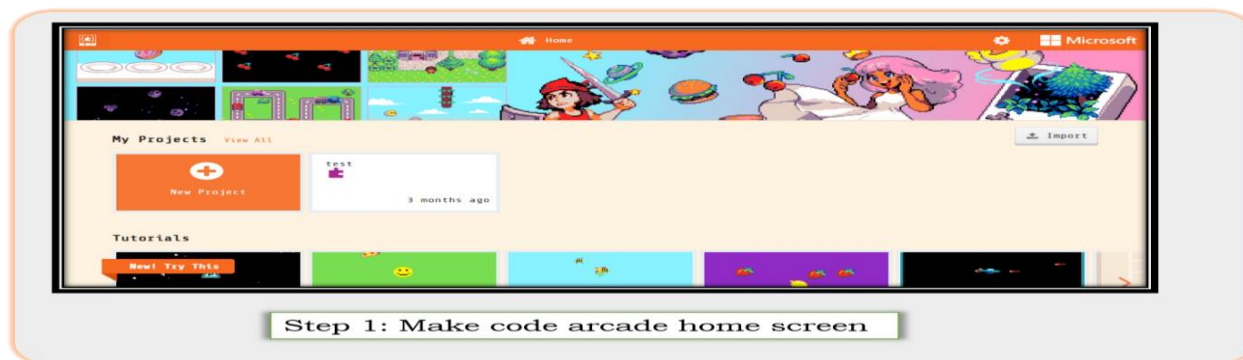
Solution:

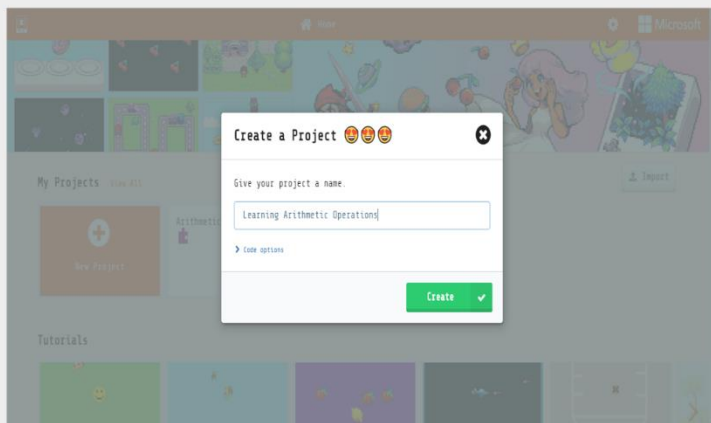
An addition arithmetic operation is used to add the values stored in two variables. Like the way we add values in mathematics, we can store values in different variables and perform an additional operation. The addition of these variables is displayed as an output of the program.

For example, performing add operation on a variable "a" holding value "3" and a variable "b" holding value "4" will result in an output "7".

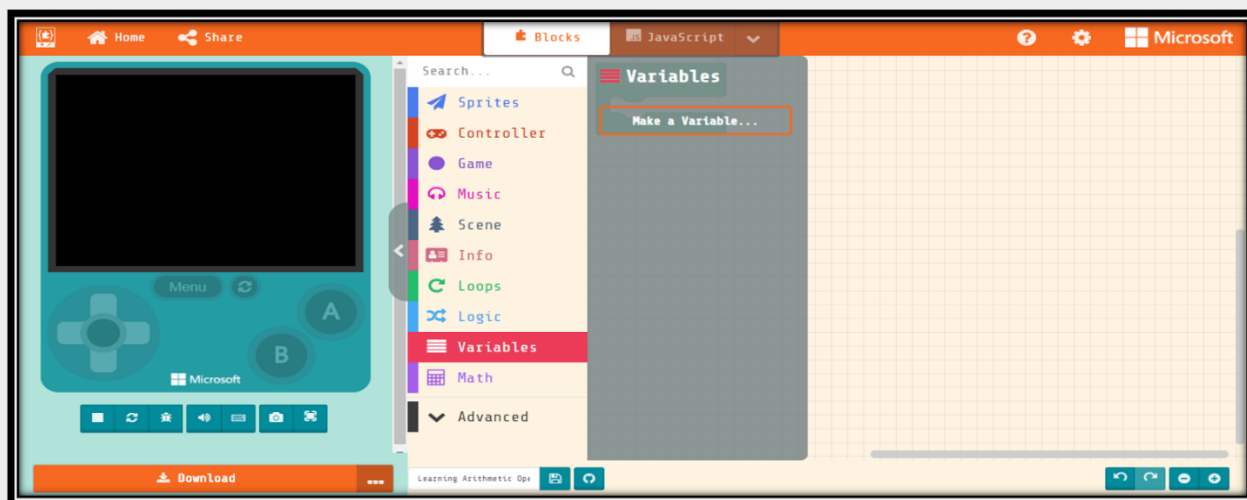
We will use variables to solve this problem

First, create a new project called "Learning arithmetic operations". Once you create your project, you should see the editor below

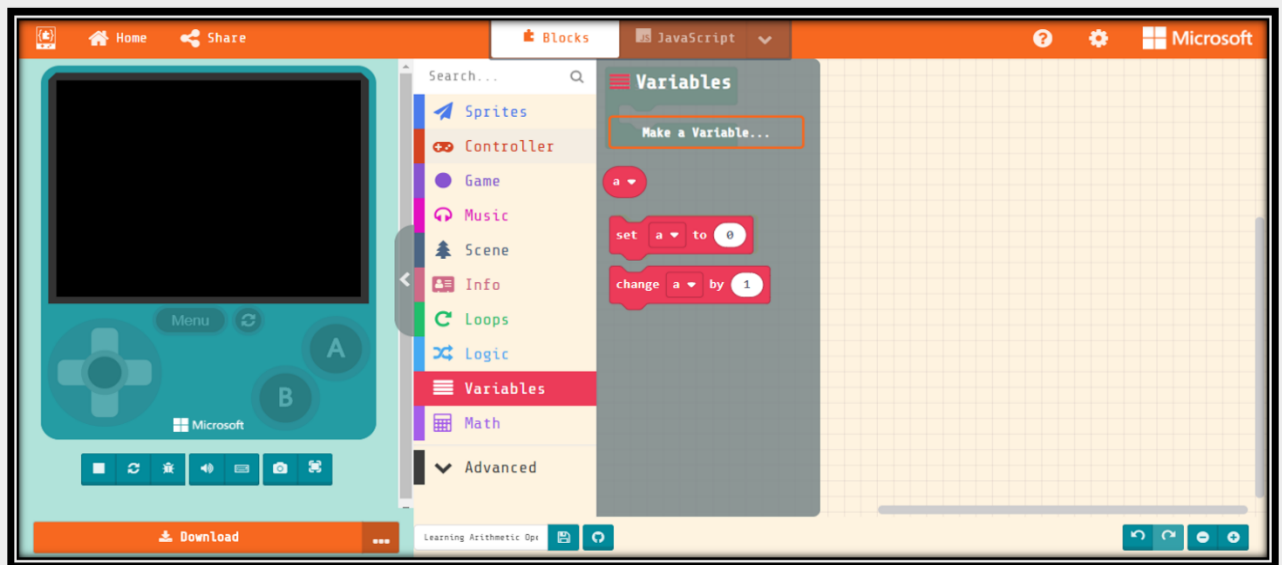




Step 2: Click on “New Project”, give a name to your project and click on “Create” button.



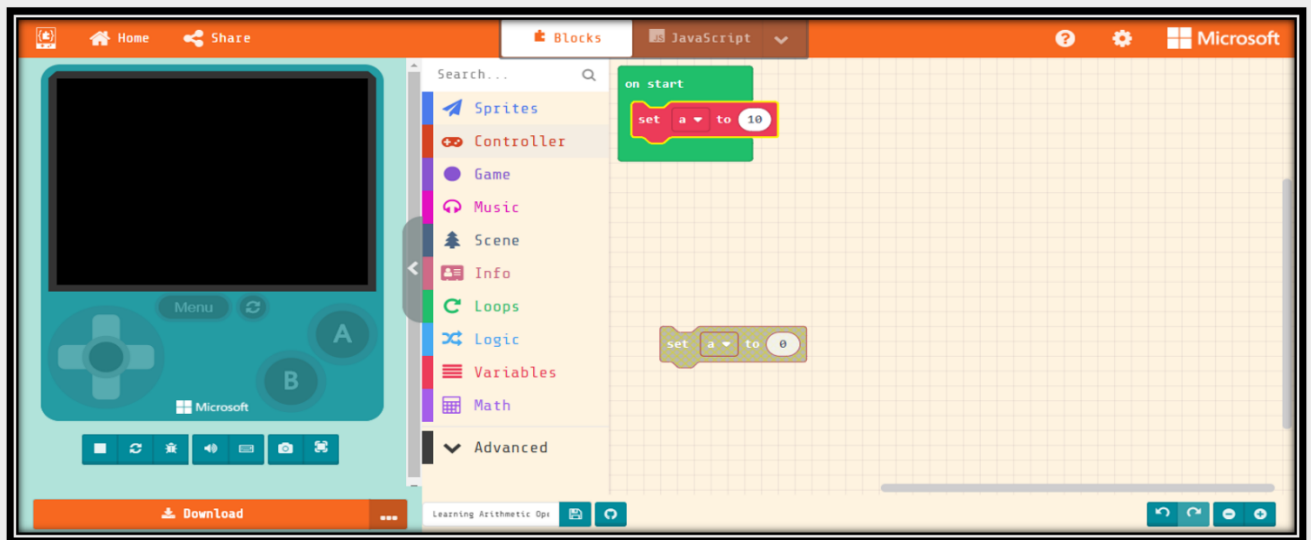
Step 3: From the list in the center of the page, Click on “Variables” and then click on “Make a Variable”



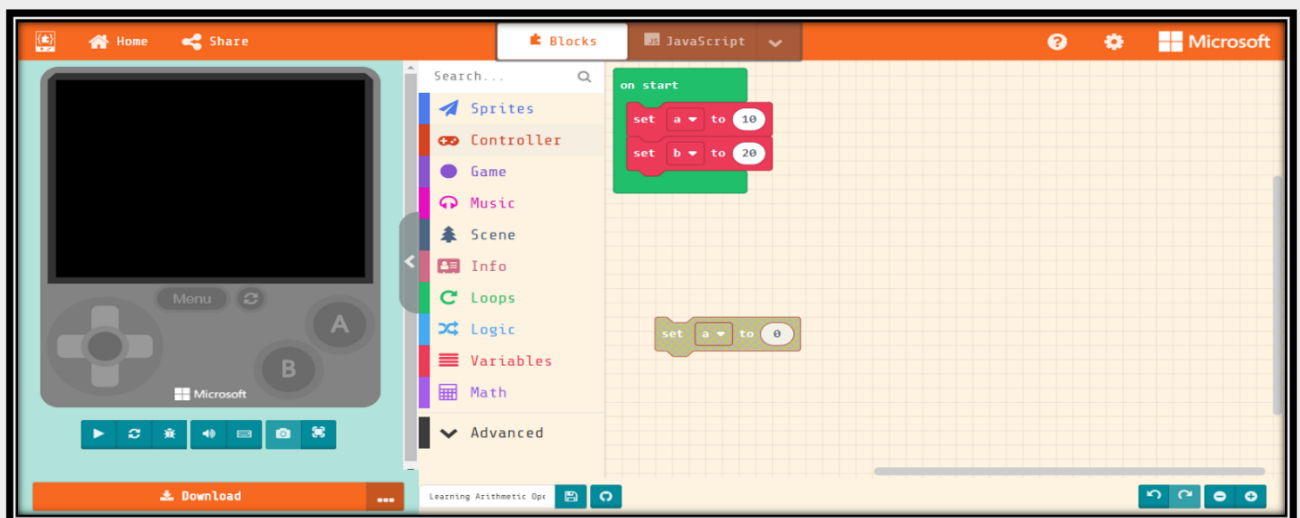
Step 4: Name the new Variable as “a” and click on “Ok” button



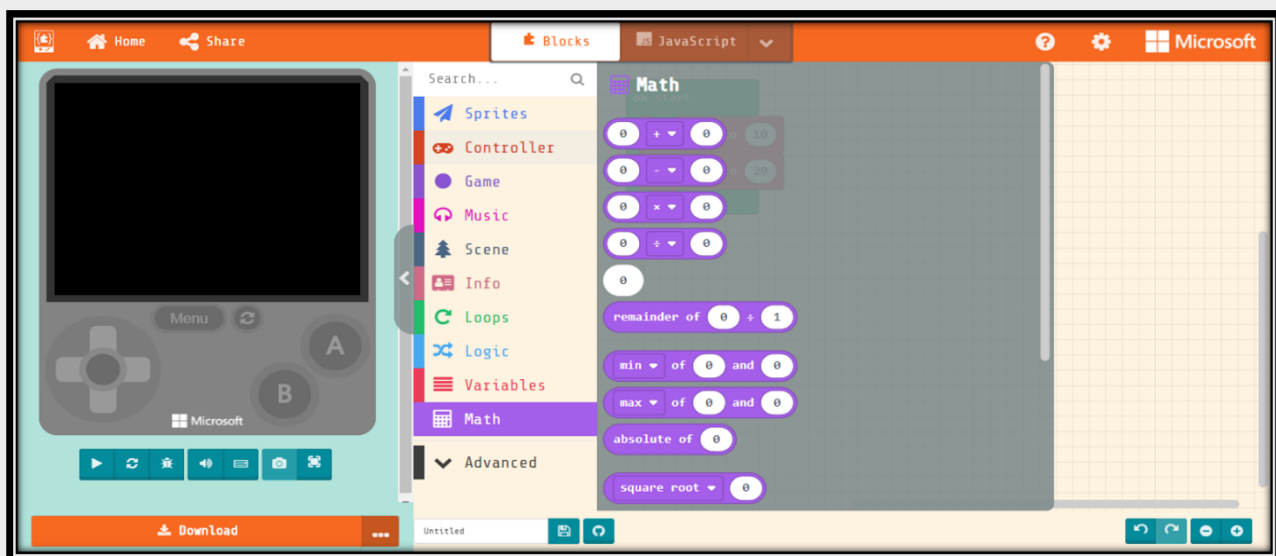
Step 5: Click on the value of “a” and change to the desired value. In this case, we are taking it as “10”



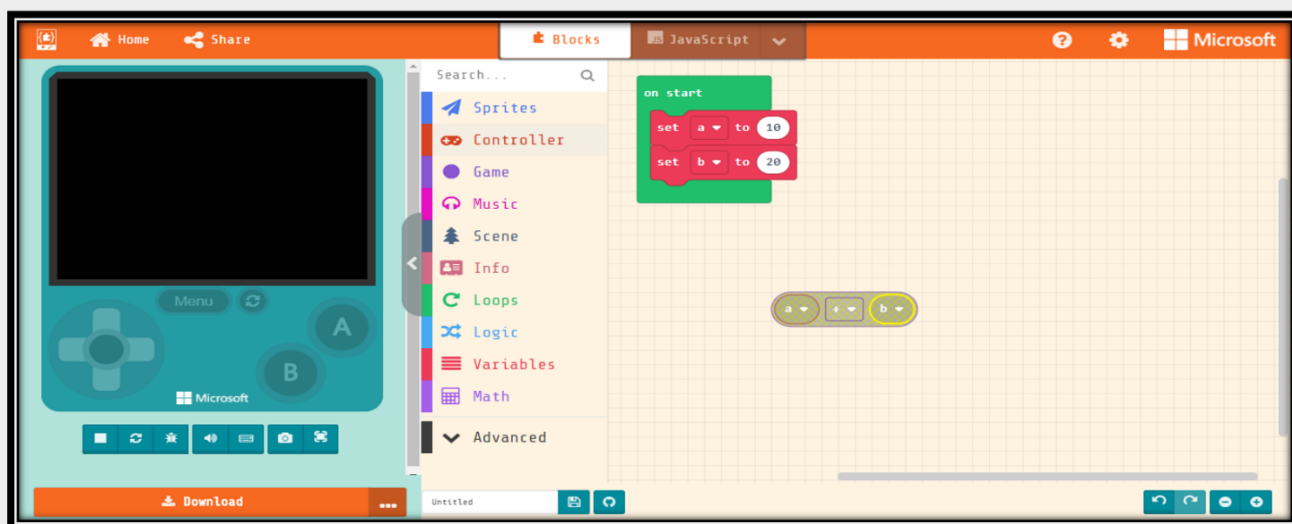
Step 6: Drag and drop “a” to the green block



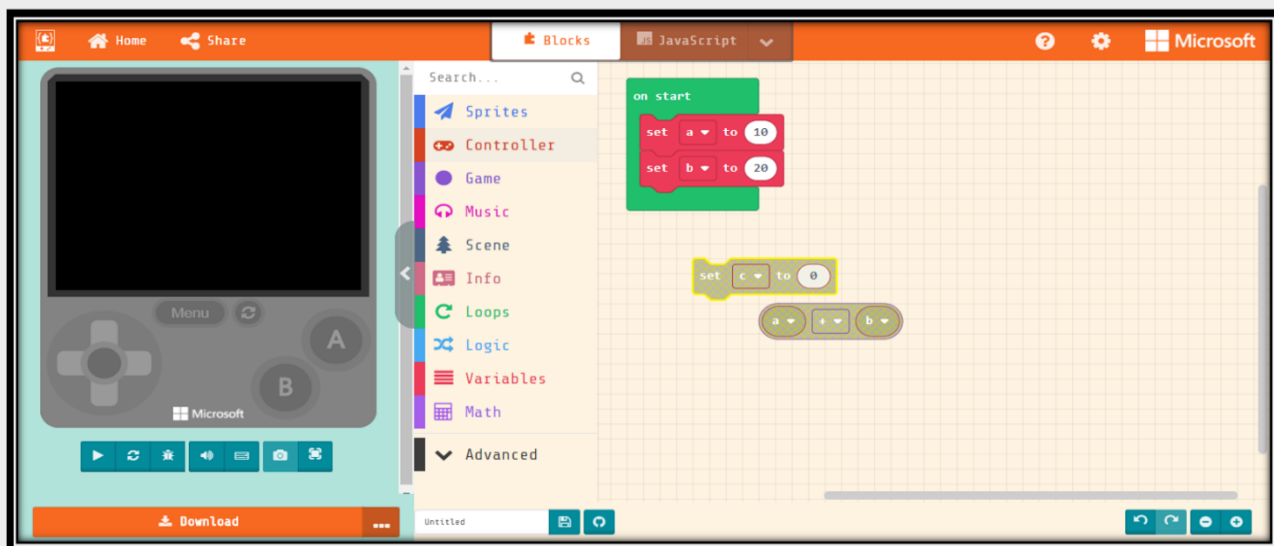
Step 7: Similarly, make another variable “b” and assign it a value “20” and drag and drop it on the green block.



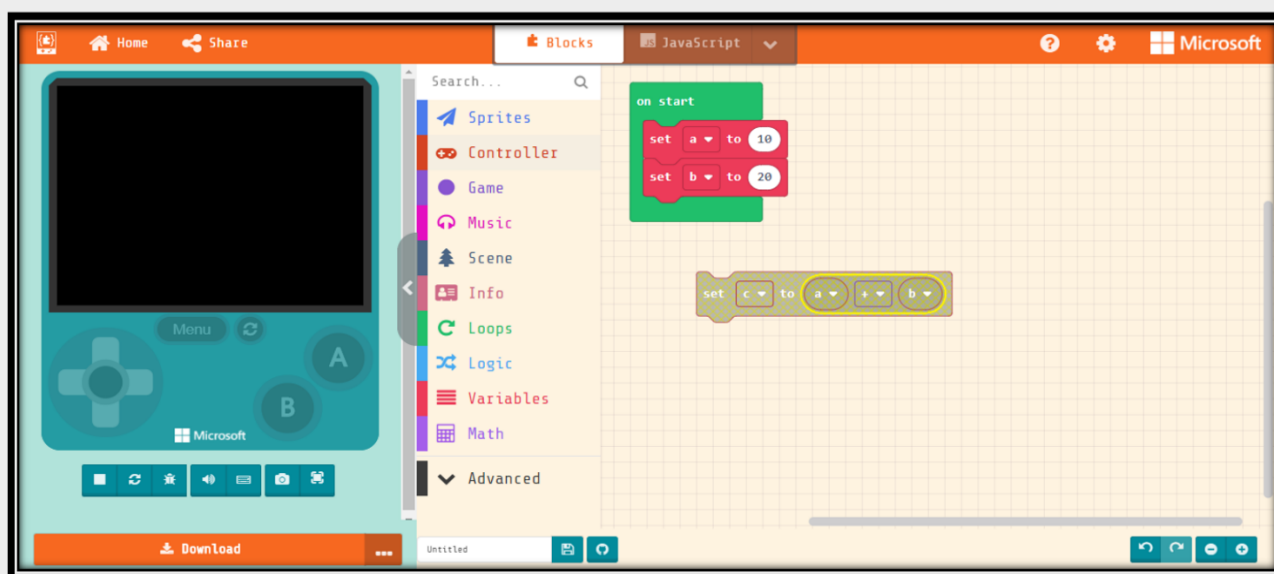
Step 8: Now click on **“Math”** link from the center of the page and click on addition operation.



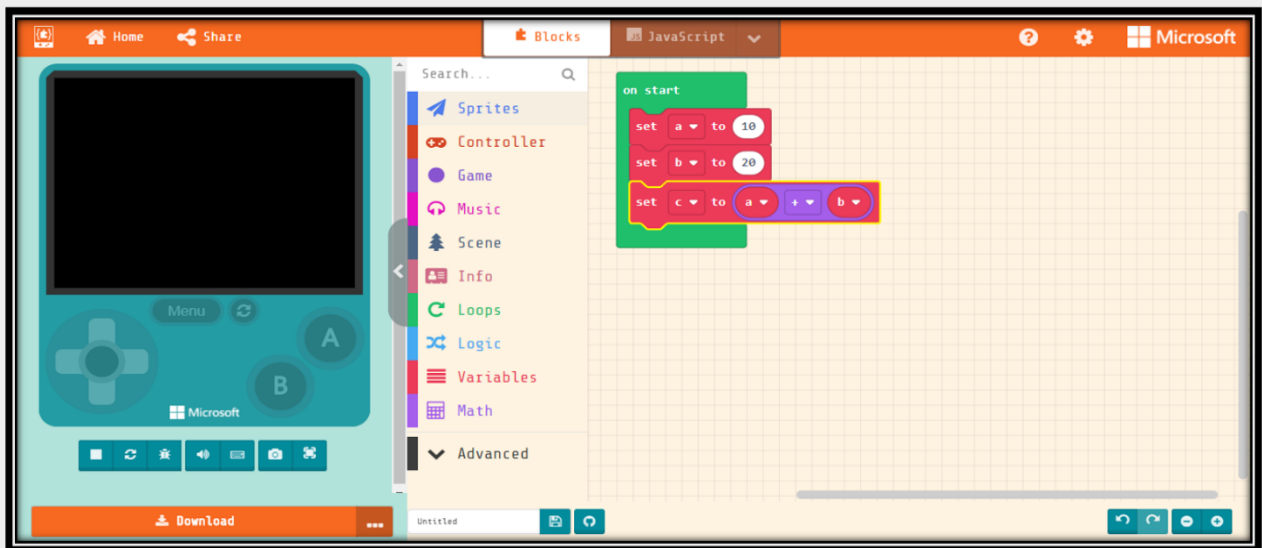
Step 9: Now click on **“Variables”** link from the center of the page and drag and drop variables **“a”** and **“b”** in the addition box as seen in the screenshot



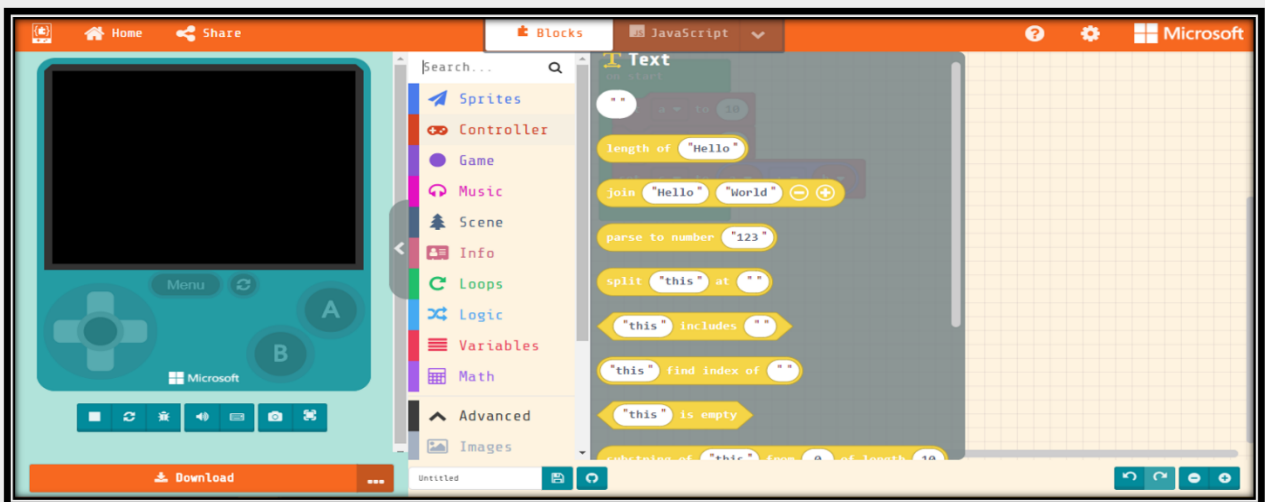
Step 10 : Like the way we had created variables “a” and “b”, now create variable “c”. Drag and drop block of “Set “c” to” in the play area.



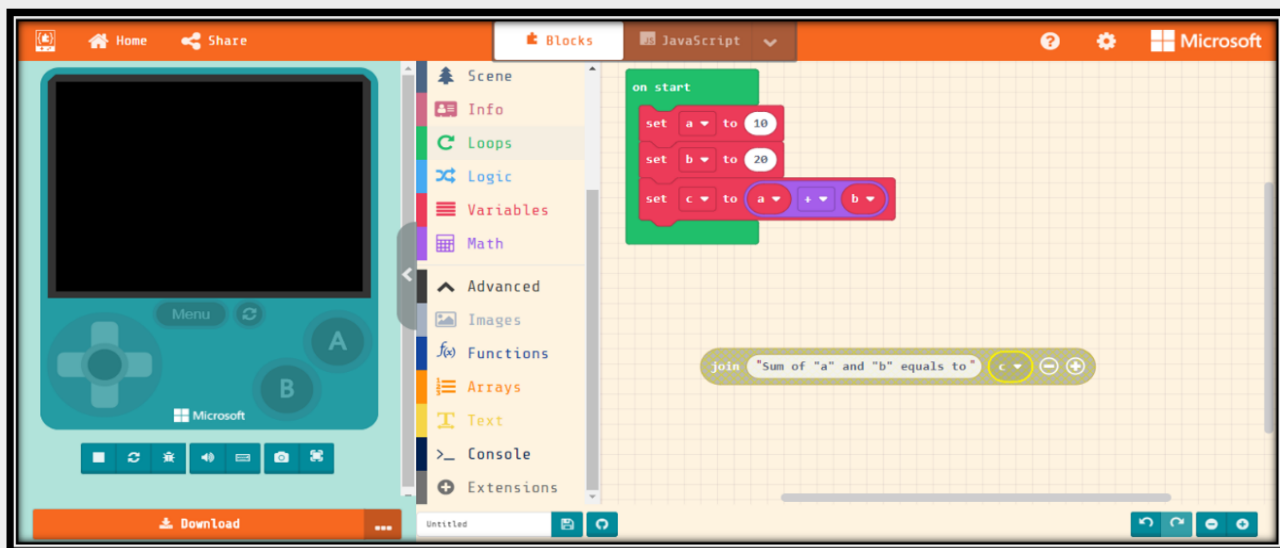
Step 11: Now drag and drop addition block in the “set “c” to” block as seen in the screenshot



Step 12: Drag the block of “Set “c” to “a” + “b”” in the green block



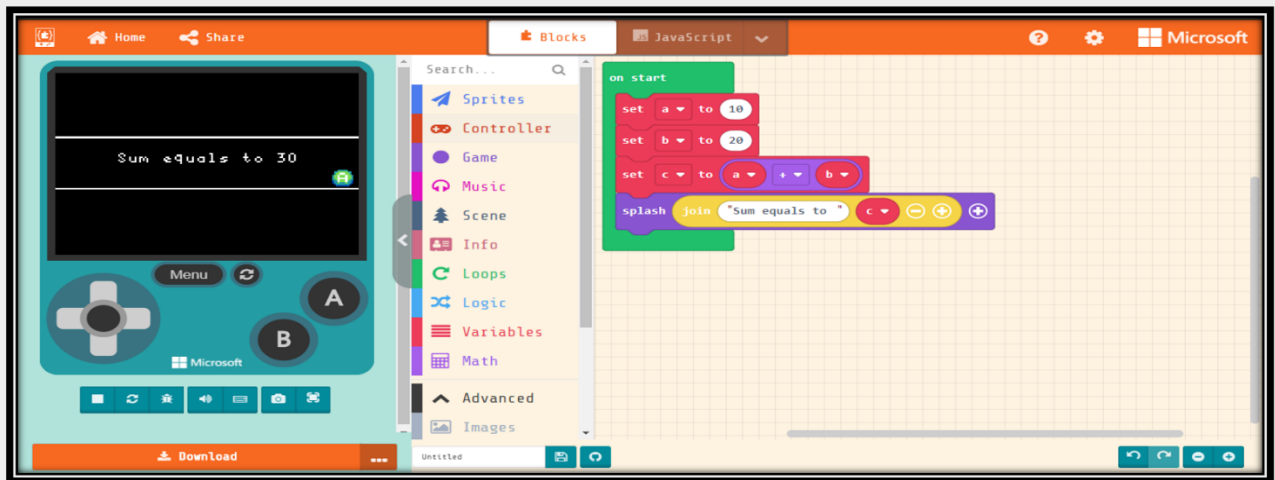
Step 13: You have now created the variables and assigned them their respective values. You have also created a third variable “c” which will have output of “a” and “b”. Let us now move ahead and see how we can execute this program. For that, first you must click on “Advanced” link from the center of the page and then click on “Text” Link. Select “Join” operation from the list



Step 14: In joint operation, you can rename the first block as “Sum equals to”. In the second block, you need to drag and drop variable “c” from Variables



Step 15: Now, click on “**Game**” link from the center of the page and click on “Splash” block. Once the splash block is visible, drag and drop “Join” block into “Splash” block



Step 16: Drag and drop the splash block into the green block, below the set “c” block



Step 17: Once these steps are completed and you click on Play button on the left-hand side of the page, you will see that the program displays the output as “30” which is the addition of “a” and “b”. Drag and drop the splash block into the green block, below the set “c” block

Likewise, you can perform all other mathematical operations in this platform and get the required output.

DYNAMIC BACKGROUNDS

Chapter: Control with Conditionals

Problem Statement: Create dynamic backgrounds using in MakeCode editor using conditional statements. Find if a number is between 5 and 20 and then change the background color in MakeCode editor.

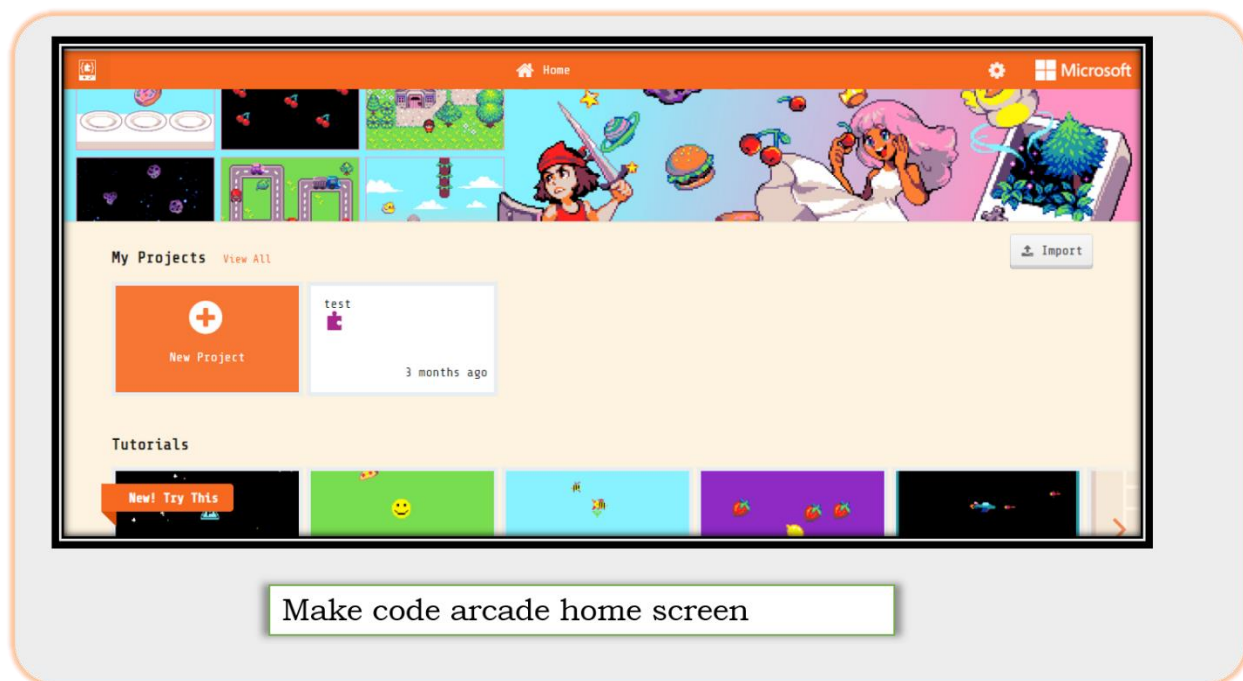
These are the steps which needs to be followed:

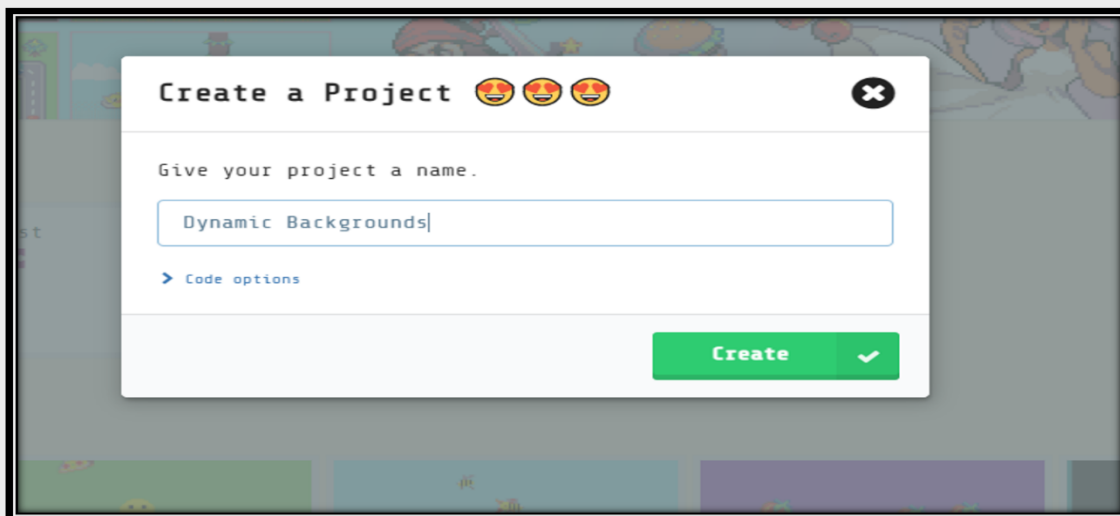
- If a number is between 5 and 20 then set the background color to green else set the background color to yellow.

Learning Outcome:

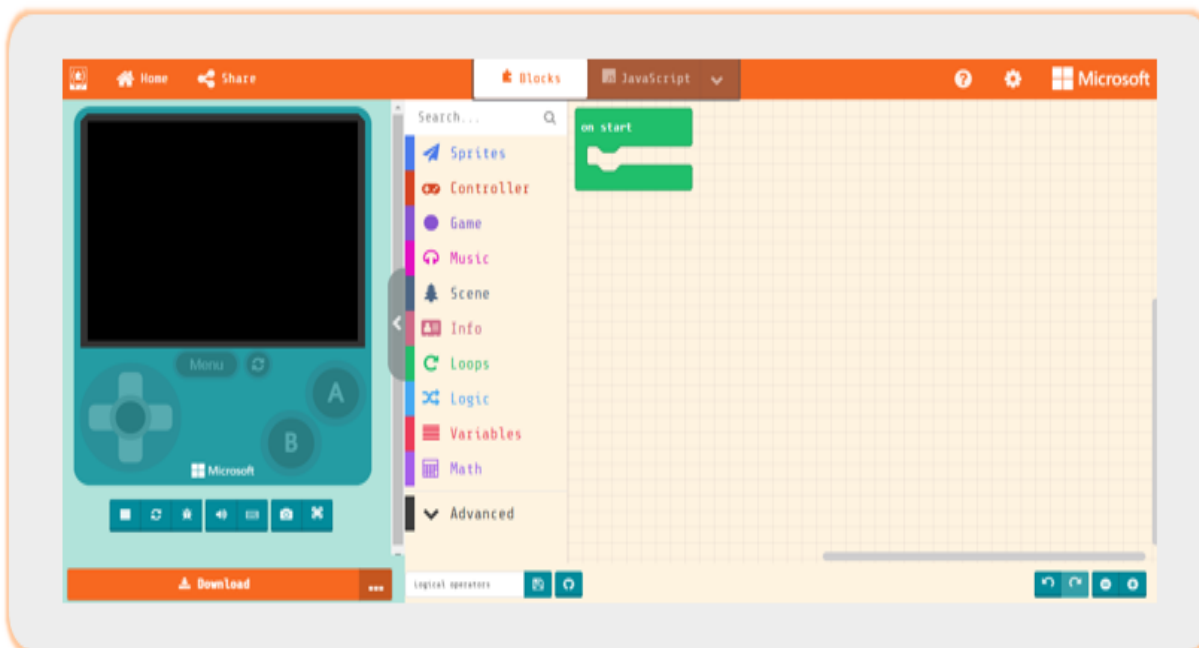
- You will learn how to use conditional statements in block coding.
- You will learn how to use variables
- You will also learn on how to use logical operators

Solution: Let us now see how we can create dynamic backgrounds in MakeCode editor. First, create a new project as shown below.





Click on new project and name it “Dynamic Backgrounds”
Once you click on create you should see an editor like below

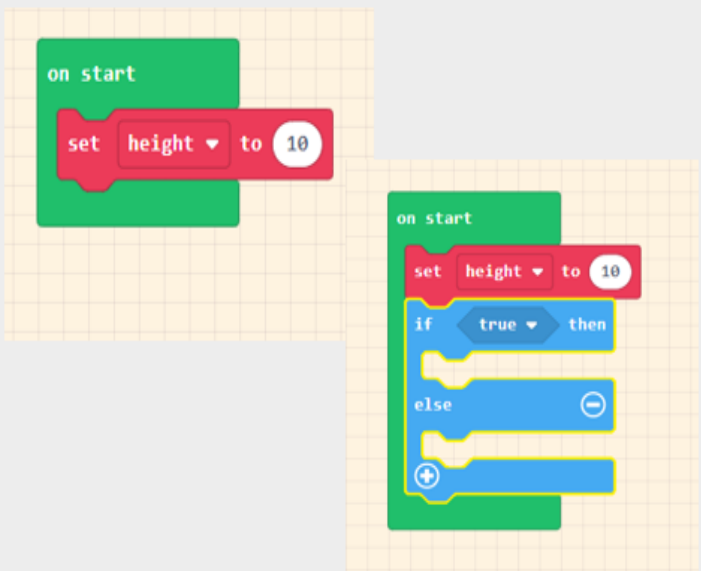


Follow the following steps to complete the exercise.



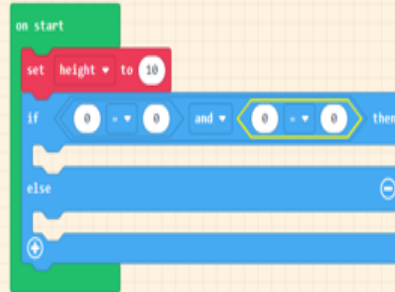
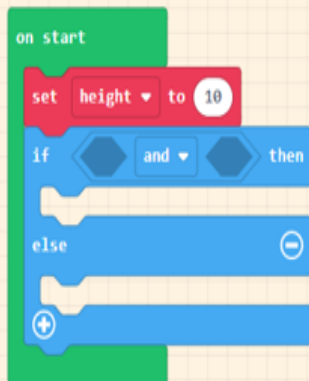
Step 1: Click on the variable menu on the left pane. Click on 'Make a Variable' and create a variable called "height".

The screenshot shows the Scratch IDE interface. On the left, the 'Variables' menu is selected. A 'New variable name' dialog box is open, with 'height' entered in the text field. Below the dialog, a 'Variables' panel shows the 'height' variable created, with 'set height to 0' and 'change height by 1' blocks.



Step 2: Set "height" to 10. Choose an if-else block from the "Logic" section.

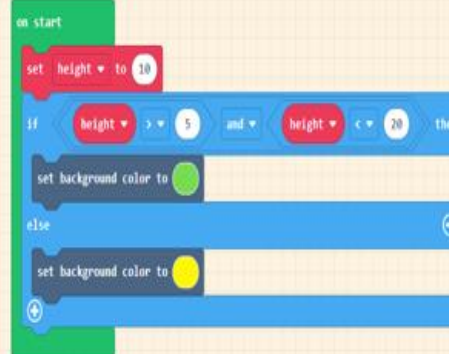
The screenshot shows the Scratch IDE interface. On the left, the 'on start' block is selected. An 'if-else' block is shown in the workspace, with 'set height to 10' in the 'if' block and an empty 'else' block.

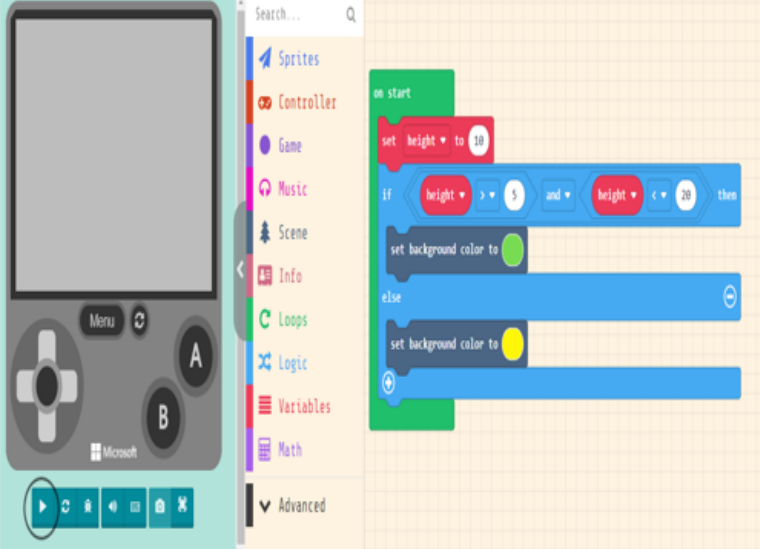


Step 3: Choose a Boolean AND operator from the logic section and add it to the if-else block as shown below. Add two comparison operators to both sides of the AND condition.




Step 4: Add the set background block from the “Scene” section to both if and else conditions. Choose different background conditions for the if and else blocks.





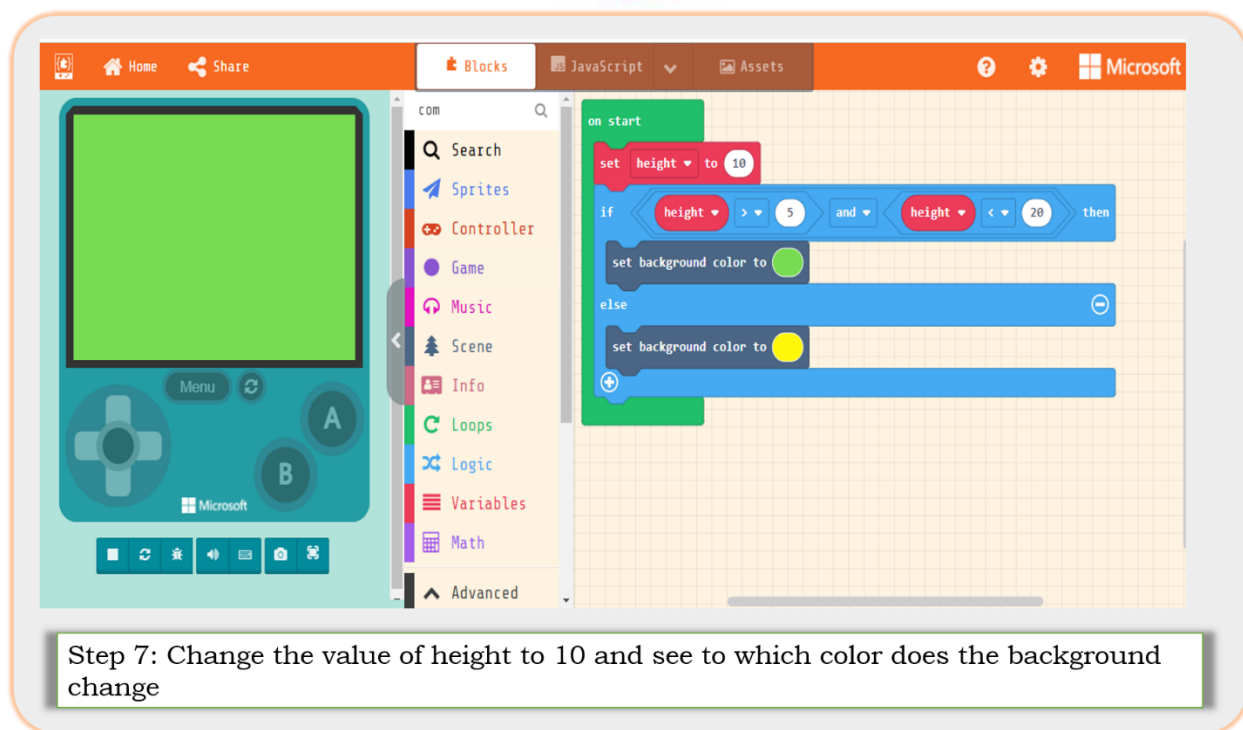
The screenshot shows the Scratch IDE. On the left is a game controller sprite. The 'Scripts' menu is open, showing an 'on start' block followed by a 'set height to 10' block. An 'if' block is added with the condition 'height > 5 and height < 20'. The 'then' branch contains a 'set background color to green' block. The 'else' branch contains a 'set background color to yellow' block. The 'Advanced' menu is open at the bottom.

Step 5: Add two comparison operators to both sides of the AND condition.



The screenshot shows the Scratch IDE. The 'set height to 10' block has been changed to 'set height to 2'. The 'if' block condition remains 'height > 5 and height < 20'. The 'then' branch contains a 'set background color to green' block. The 'else' branch contains a 'set background color to yellow' block. The background of the game controller sprite is now yellow.

Step 6: Change the value of height to 2 and see if the background changes!



When you change the height to 10 the loop will go inside the if condition as the height is greater than 5 AND less than 20. The background color will change to green.

So, what did we learn from this project?

You have now learnt how to create conditional statements. What do you think will the output of the code be if you change the height to 15?

That is correct! The background color changes to green as height is greater than 5 AND less than 20.

THE REMAINDER PROBLEM

Chapter: Control with Conditionals

Problem Statement: Using nested conditional statements find if a number is divisible by 2 or 3 and then change the background color in MakeCode editor.

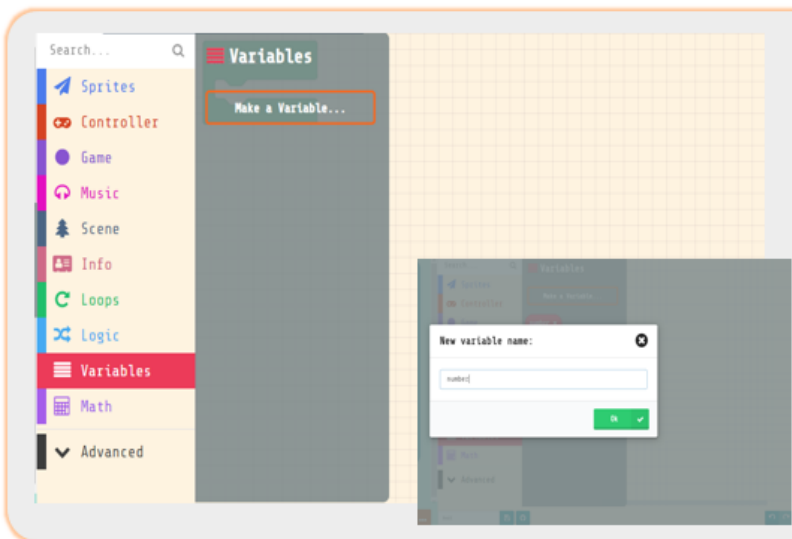
These are the steps which needs to be followed:

- If a number is divisible by both 2 and 3 then set the background color to red
- If a number is divisible by 2 but not 3 then set the background color to orange

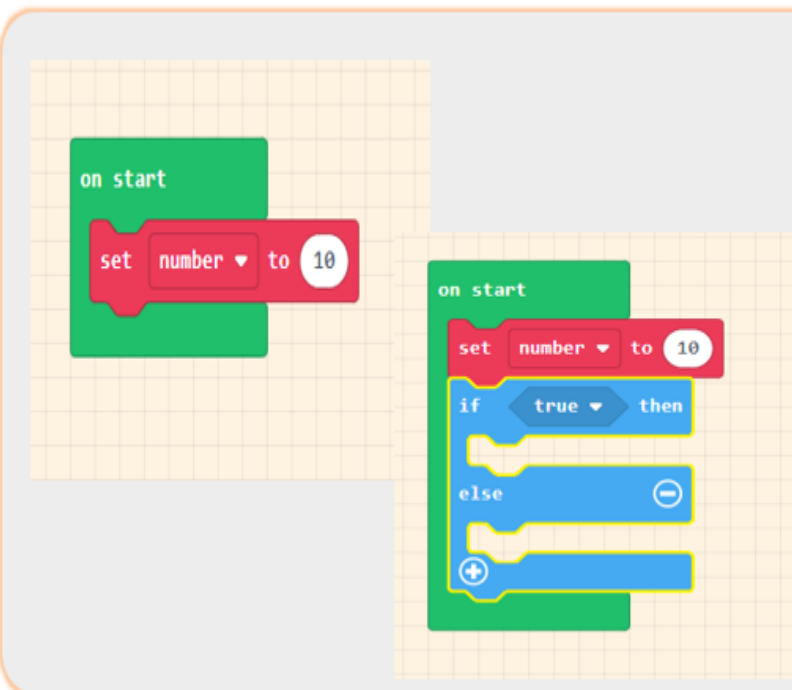
Learning Outcome:

- You will learn how to use nested conditional statements in block coding.
- You will learn how to use variables
- You will also learn on how to use logical operators

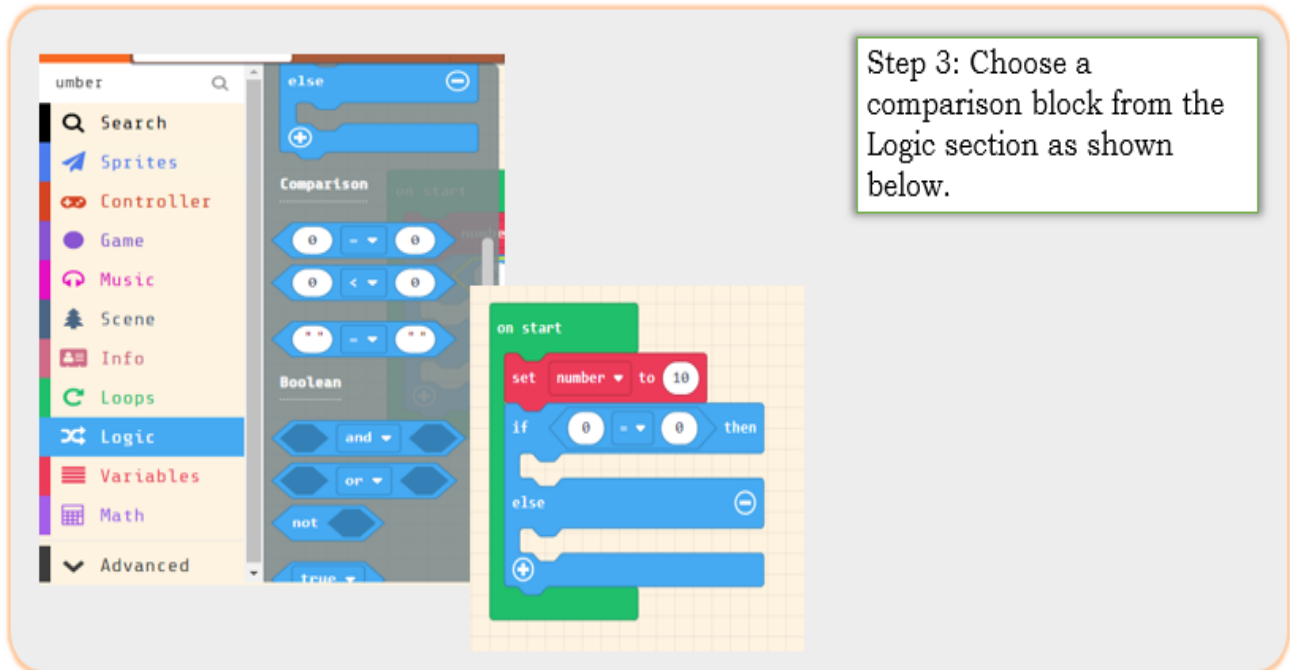
Solution: Follow the steps to do this activity



Step 1: Click on the variable menu on the left pane. Click on **'Make a Variable'** and create a variable called **"number"**.

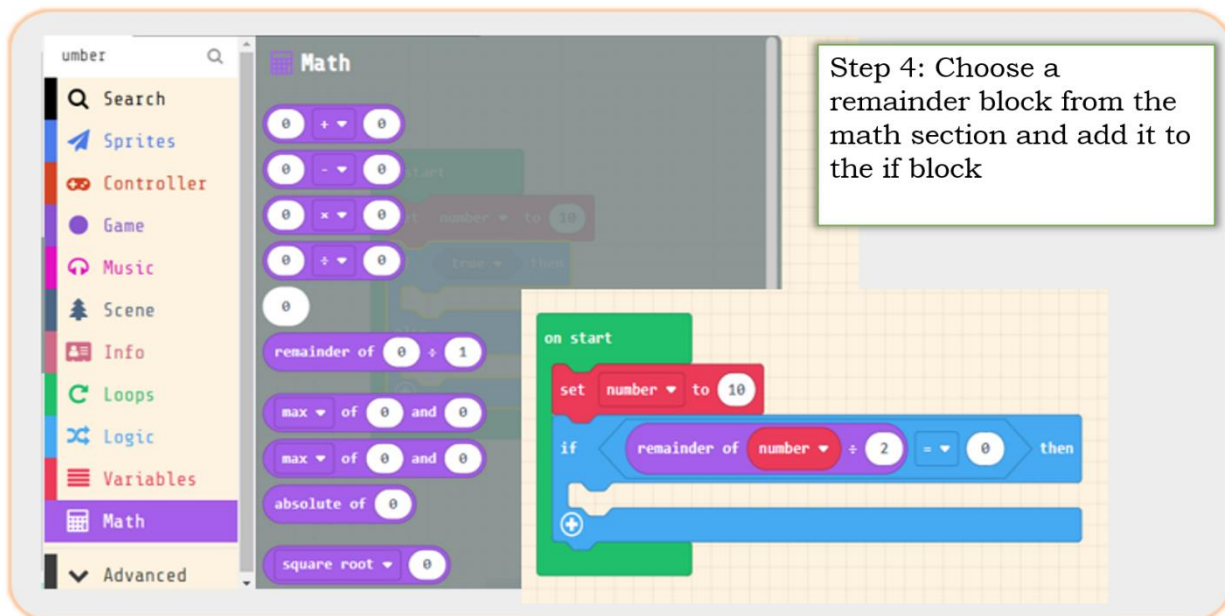


Step 2: Choose the set block and set the value of number to 10. Choose an if-else block from the **"Logic"** section.



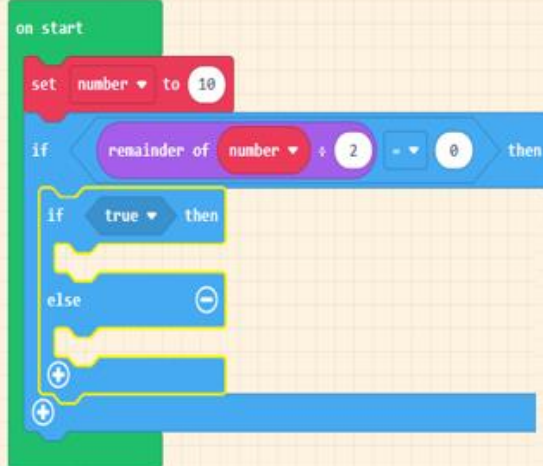
The Scratch interface shows the 'Logic' section selected in the left sidebar. The 'Comparison' category is expanded, displaying various comparison blocks like '0 < 0', '0 <= 0', '0 > 0', '0 >= 0', '0 = 0', '0 <= 0', '0 >= 0', and '0 = 0'. A 'true' block is also visible. A script area on the right shows an 'on start' block followed by a 'set number to 10' block and an 'if' block with a comparison block (0 < 0) and a 'then' block.

Step 3: Choose a comparison block from the Logic section as shown below.

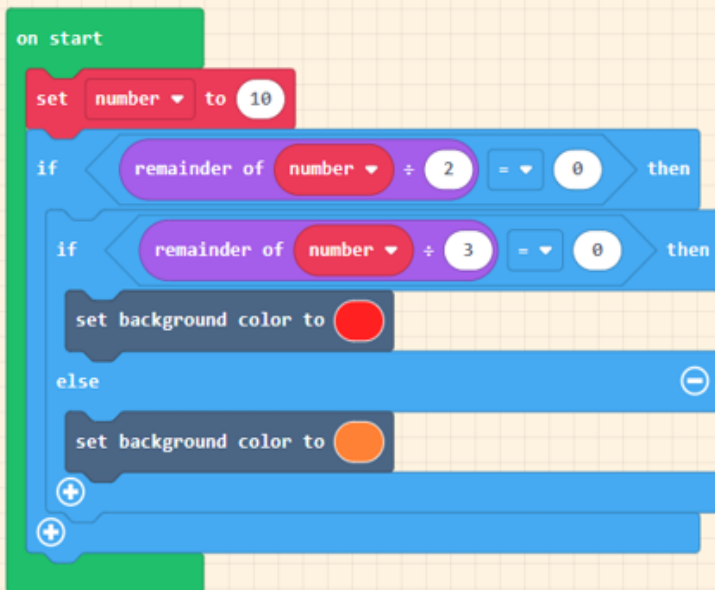
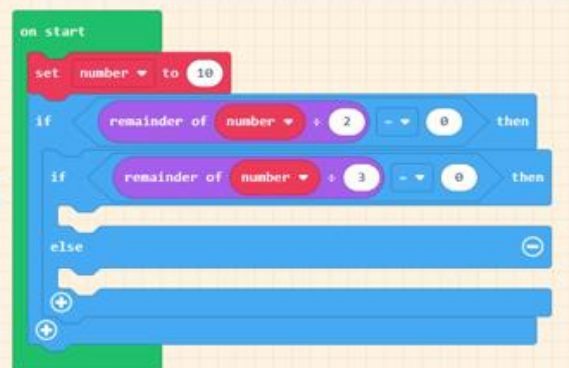


The Scratch interface shows the 'Math' section selected in the left sidebar. The 'remainder of' block is highlighted. A script area on the right shows an 'on start' block followed by a 'set number to 10' block and an 'if' block with a comparison block (remainder of number ÷ 2 = 0) and a 'then' block.

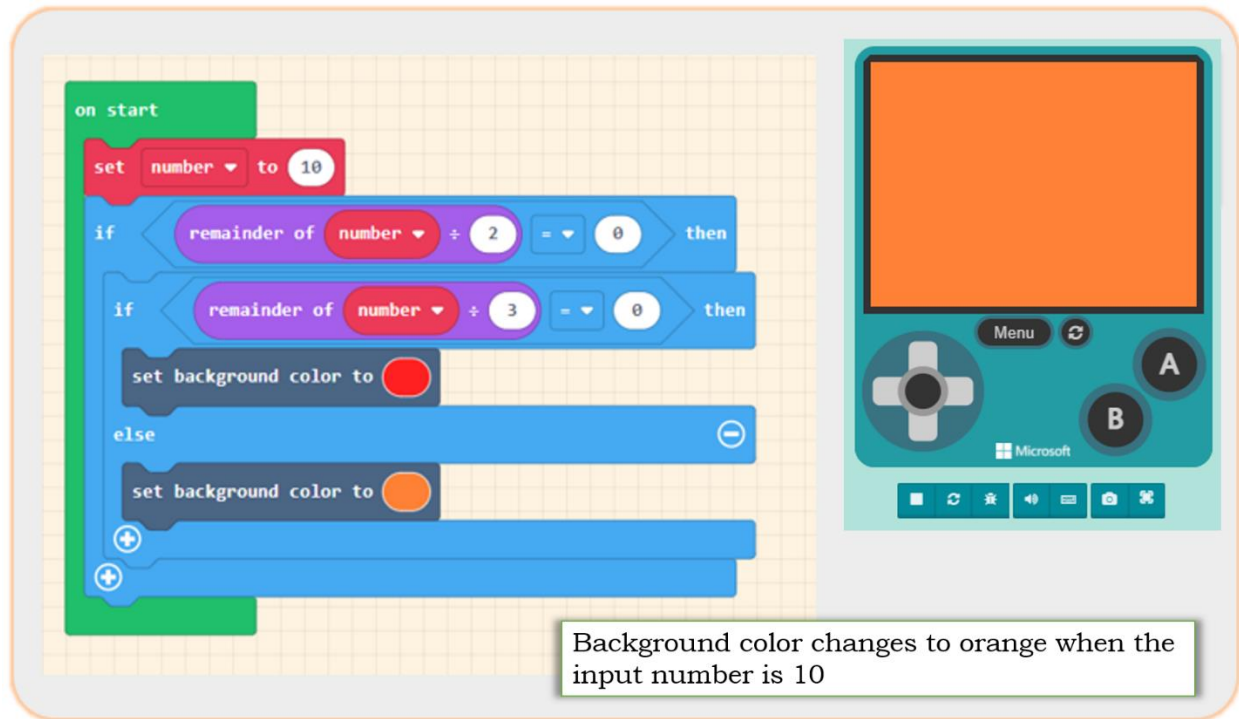
Step 4: Choose a remainder block from the math section and add it to the if block



Step 5: Add a remainder block like step 5 and check if the number is the remainder on dividing by 3 is also zero.



Step 6: Add the set background label to both the if and else blocks.



Result

You can now change the value of the number to 6 and check if the background of the controller changes. The background should change to red for numbers that are divisible both by 2 and 3. It should change to orange for numbers that are divisible by 2 but not by 3.

BUILDING A MUSIC PLAYER

Chapter: Loops with Block Coding

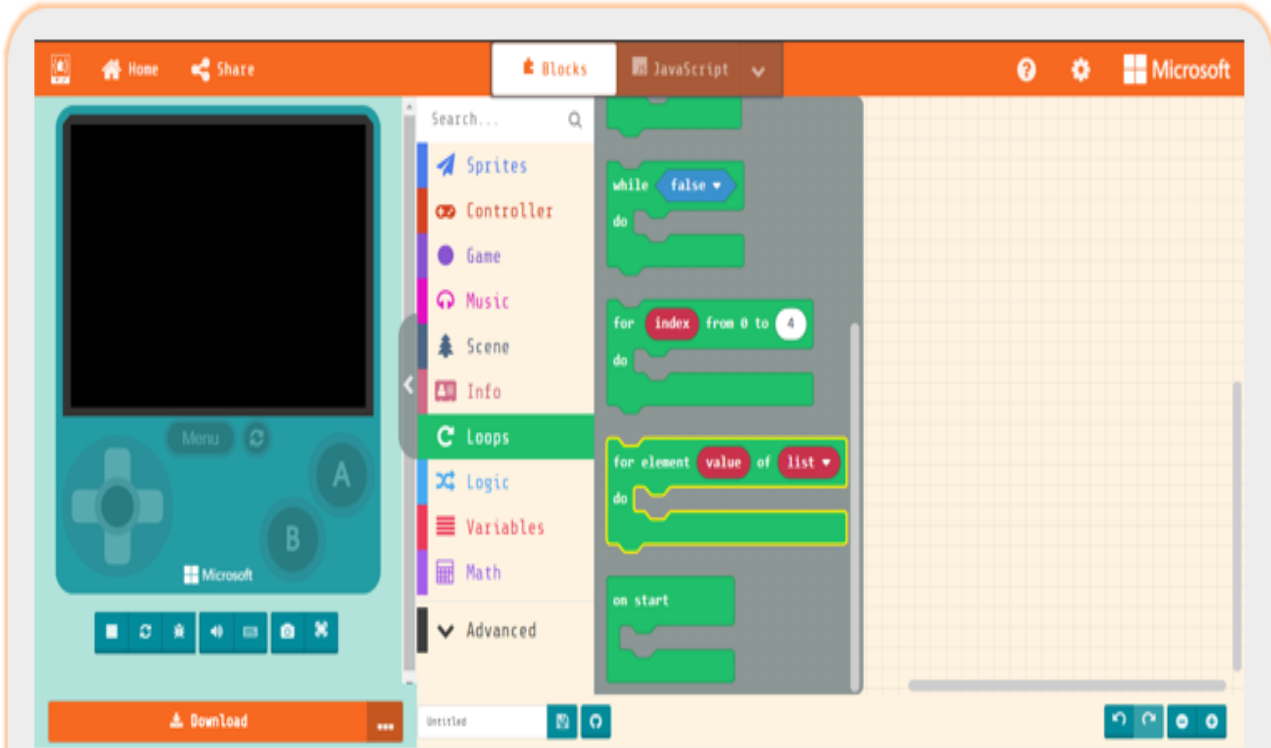
Problem Statement: Create a music player using loops in MakeCode by playing a music tone repeatedly for n number of times.

Learning Outcome:

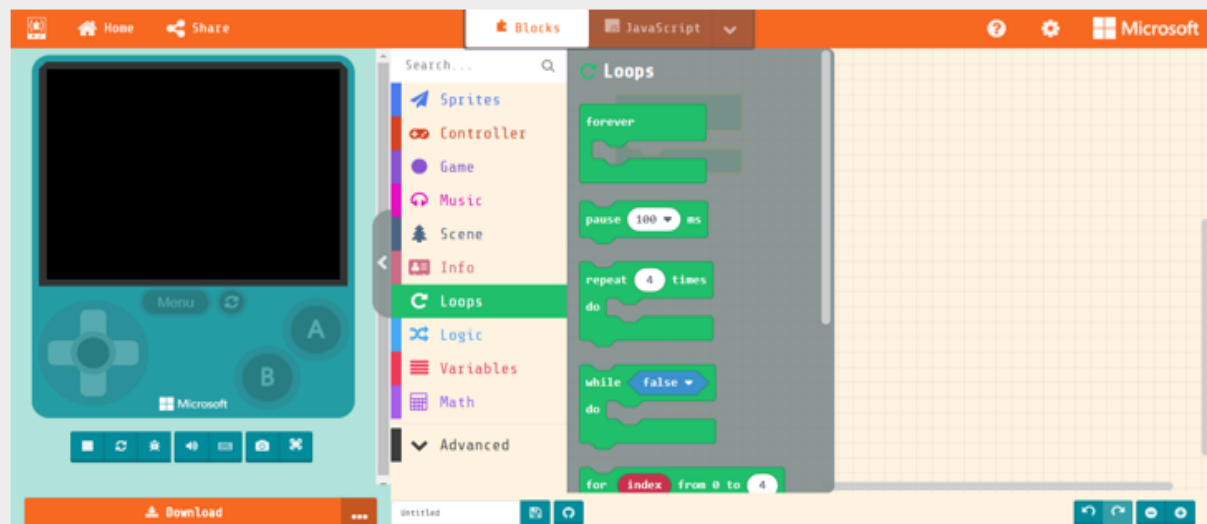
- You will learn how to use loops to repeat an operation using block coding.

Solution:

Follow the below steps so that you can create a music player using loops



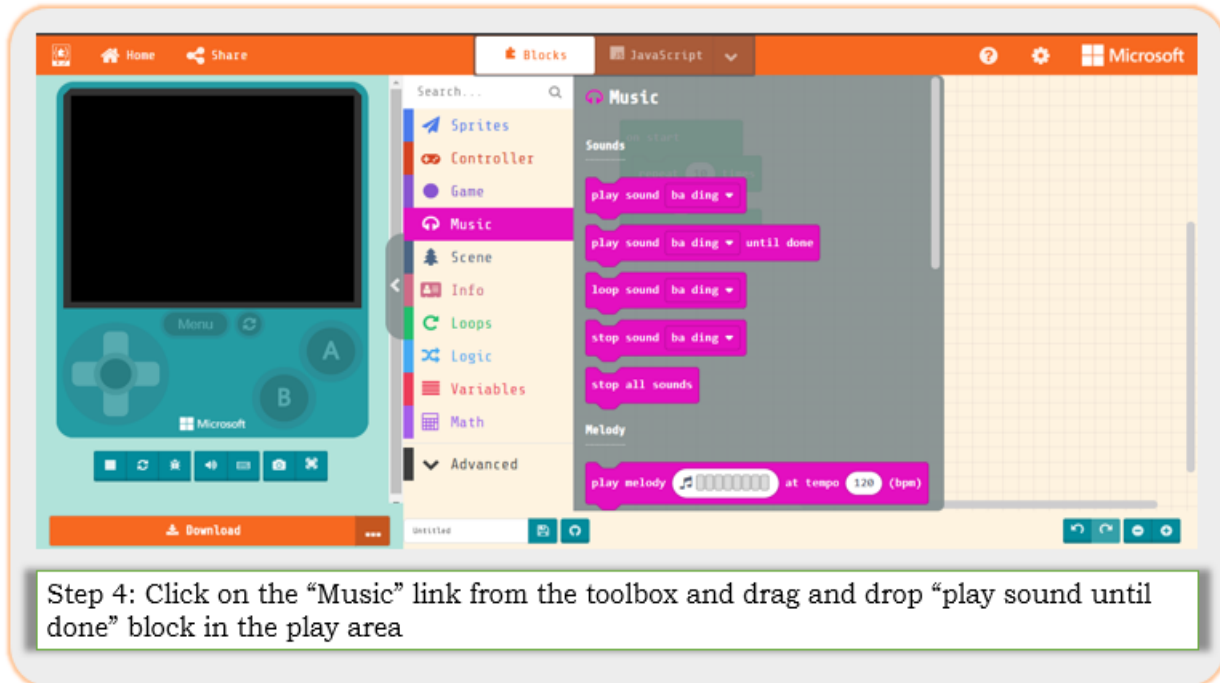
Step 1: In the arcade MakeCode editor, click on “Loops” link in the toolbox and then drag and drop “on start” block to the play area.



Step 2: Again, click on the “Loops” link in Toolbox in the center of the page. Drag and drop “repeat 4 time do” block to the play area as shown in the image below

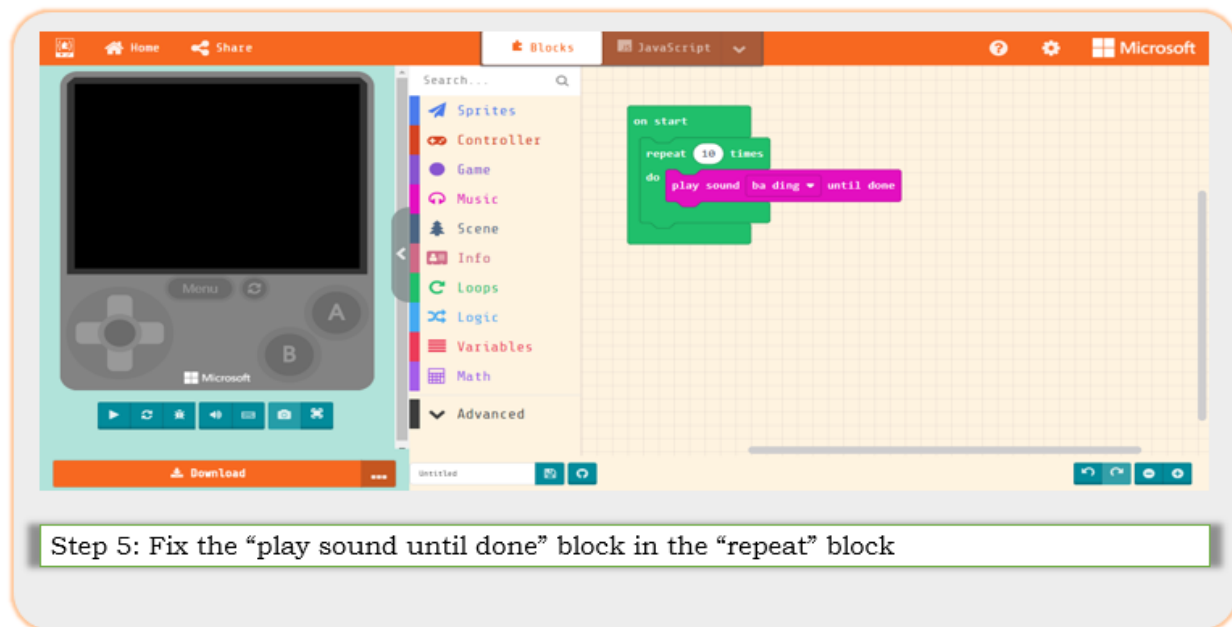


Step 3: Now, move the “repeat” block and place it inside “start” block. Also, reset the value in “repeat” block to “10”



The screenshot shows the Microsoft MakeCode editor interface. On the left is a gamepad sprite. The 'Blocks' tab is selected, and the 'Music' category is highlighted in the toolbox. A 'play sound ba ding until done' block is being dragged from the toolbox to the 'on start' event block in the workspace. The workspace also contains other music blocks like 'play sound', 'loop sound', 'stop sound', and 'stop all sounds'.

Step 4: Click on the “Music” link from the toolbox and drag and drop “play sound until done” block in the play area



The screenshot shows the Microsoft MakeCode editor interface. The 'on start' event block now contains a 'repeat 10 times' block, which in turn contains the 'play sound ba ding until done' block. The 'repeat' block is set to repeat 10 times.

Step 5: Fix the “play sound until done” block in the “repeat” block

When you click on the play for the above exercise that we created, you will hear the music 10 times. The loop repeats itself 10 times (counter that we had set).

A TALE OF TWO VILLAGES

Chapter: Loops with Block Coding

Problem Statement: You are challenged to use the power of code to connect two villages in Minecraft through some fun activities.

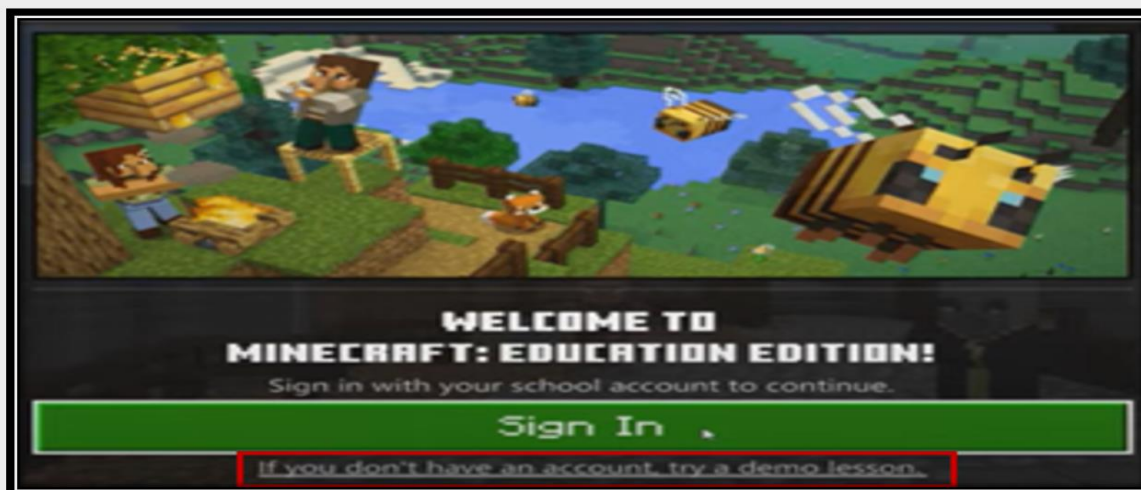
Learning Outcome:

- You will learn inclusion and empathy; you will develop compassion for your neighbors.
- You will learn about collaboration and equity and adopt the diversity that makes us all distinctive as they complete the activities.

Solution:

In this exercise, we will use basic coding concepts to bring two villages together in **Minecraft: Education Edition**. You can setup Minecraft education edition from

<https://education.minecraft.net/get-started>



Step 1: Click on try a demo lesson and accept the terms and conditions to start the activity



Step 2: Choose the 2020 lesson and click on **“Create World”**



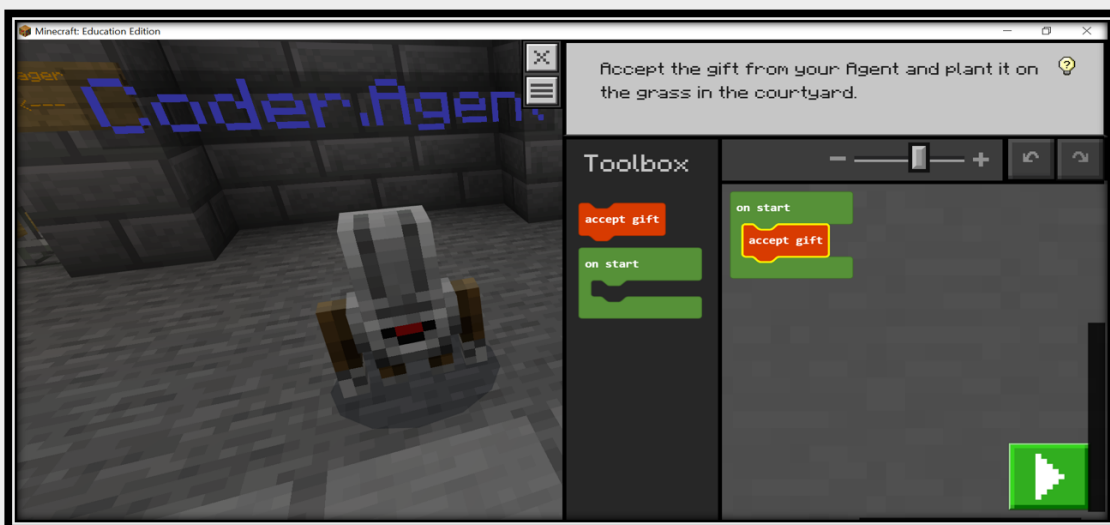
Step 3: In this world the villagers and the illagers share the same space but they seldom interact. Your job is to bring the two villages together to learn from each other and appreciate each other too. Start your journey at the castle by learning to move using the keyboard and mouse or touch commands.



Step 4: Press W to move forward. When you see a non-Player character, Right click to read what they have to say. Your onboarding activities will help you decide which coding language to use, either MakeCode Blocks or Python. For this activity we will use blocks.



Step 5: Move the agent forward just enough so that it can stand on the gold block. To start coding press C or tap the agent icon at the top of the screen if you're using touch. Remember to press play when ready to run your code.

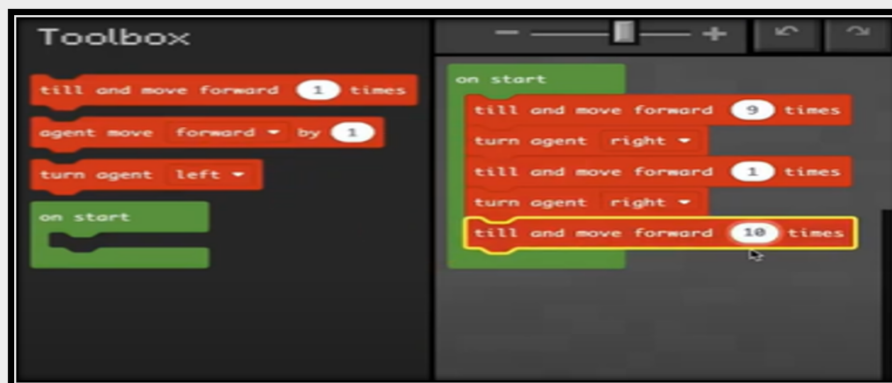


Step 6: The agent has given you a gift. Plant your sapling with code, and it will grow as you complete the challenges in the villages. Come back and see your progress after each challenge.

There are many other challenges that can be done. Let us do one more to help illagers learn how to farm.

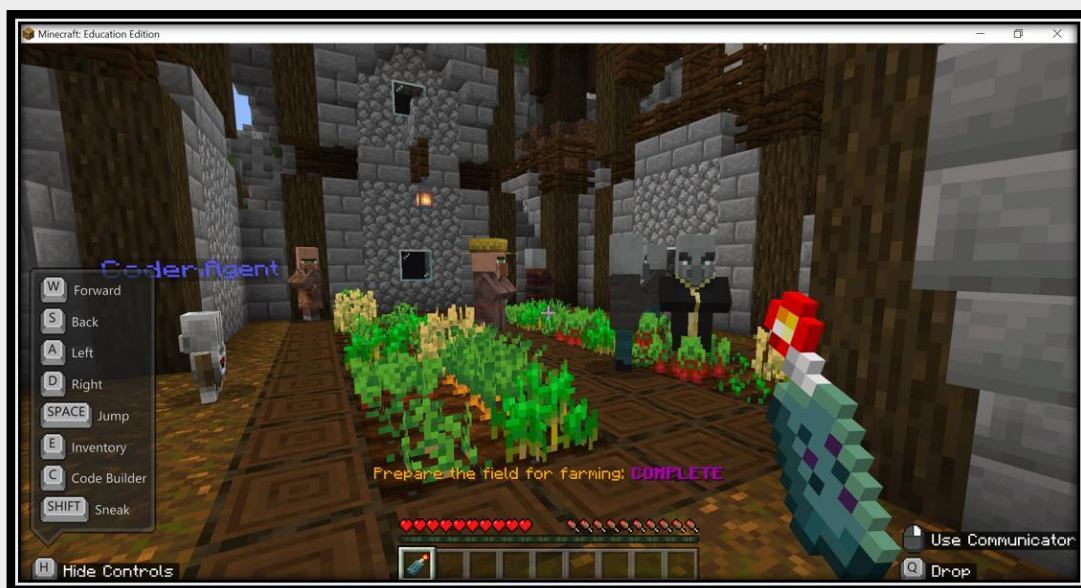


Step 7: **Teach farming** – In this activity the agent will show the illagers how to till two rows of land



Step 8: These are the following steps we are going to do:

- Till and move the agent forward by 9 times
- Turn the agent right
- Move agent forward by 1
- Turn the agent right
- Till and move forward the agent by 10 times
- Click on play



Result: Preparing field for farming activity is complete

Refer <https://education.minecraft.net/hour-of-code-2020> for the entire activity.



HOW TO MAKE A CUP OF COFFEE

Chapter: Algorithms with Block Coding

Problem Statement: In this activity we will learn how to make a cup of coffee. There are a few instructions which need to be followed:

Step by step instructions:

1. Fill the kettle with water.
2. Turn on the stove.
3. Check to see if the water is boiling.
4. If the water is boiling then, add coffee powder.
5. If the water is not boiling, wait for the water to boil and then add the coffee powder.
6. Turn off the stove
7. Strain the coffee in a cup

Referring to the above step by step instruction create a flowchart on how to make a cup of coffee

Learning Outcome:

- You will learn how to create a flowchart using an algorithm.

Solution:

You have been asked to make a cup of coffee.

What we saw in the question is a step by step instruction to make a cup of coffee

Let's now represent the instructions using a flowchart

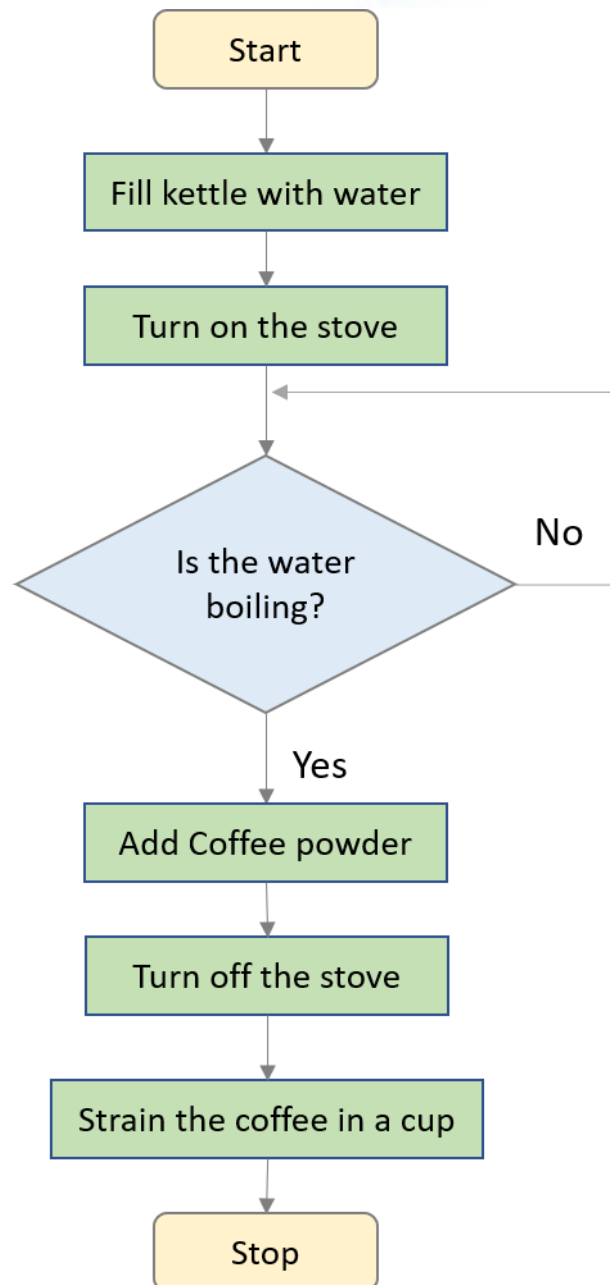


Fig 1.0 : How To Make A Cup Of Coffee



OPEN PRESENT ONLY IF IT'S YOUR BIRTHDAY

Chapter: Algorithms with Block Coding

Problem Statement: In this activity we will open a present/gift only if it's your birthday. These are the step by step algorithm which will decide if you can open a present or not:

Step by step algorithm:

1. Input your birthday (Month and date)
2. Input the present date
3. Check to see today's date and month is equal to your birthday
4. If yes, then you can open the present
5. If no, then check again everyday till it's your birthday
6. End

Using the above step by step algorithm, create a flowchart for the situation where you can open a present only if it's your birthday

Learning Outcome:

- You will learn how to create a flowchart using a step by step algorithm.

Solution:

You have been asked to draw a flowchart to open a present only if it's your birthday

What we saw in the question was a step by step algorithm for the above situation

Let's now represent the steps using a flowchart:

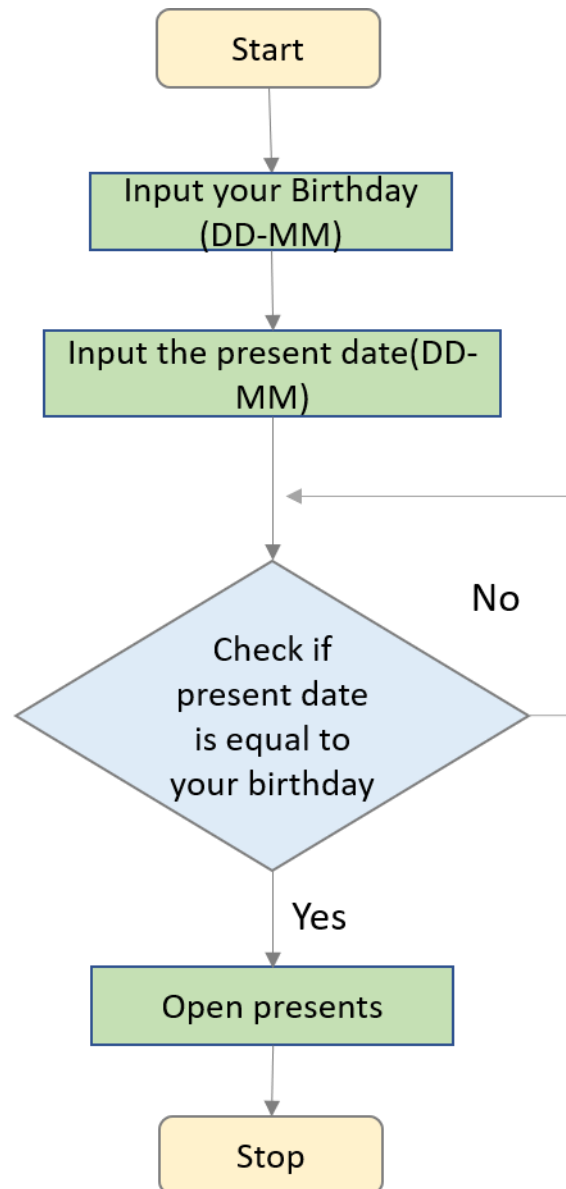


Fig 2.0 : Open Presents Only If It's Your Birthday



BUYING BOOK ONLINE

Chapter: Algorithms with Block Coding

Problem Statement: You need a book for a school activity, and you cannot find the book in any nearby bookshops. Your parents have asked you to order the book online. Make a step by step algorithm on how to order a book online and then create a flowchart for the algorithm.

Learning Outcome:

- You will learn how to create a step by step algorithm on how to buy a book online
- You will also learn how to create a flowchart using the algorithm you write.

Solution:

You have been asked to make the algorithm and flowchart on how to order a book online

Step by step algorithm:

1. Go to a website
2. Are you a registered member?
3. If you are not a registered member, then sign up and then sign in the website
4. If you are a registered member, then sign in
5. Search for the book
6. Is the book available?
7. If the book is not available in this website, go back to step 1
8. If yes, Add to the cart
9. Review your order
10. Select the payment method
11. Enter the information, If the entered information is correct place order ,If not then make changes and check if the information entered is correct and then place order
12. End

You can add various steps in the flowchart like options for payment method, options for shipping etc.

What we saw was a step by step algorithm for the above situation

Let's now represent the steps using a flowchart

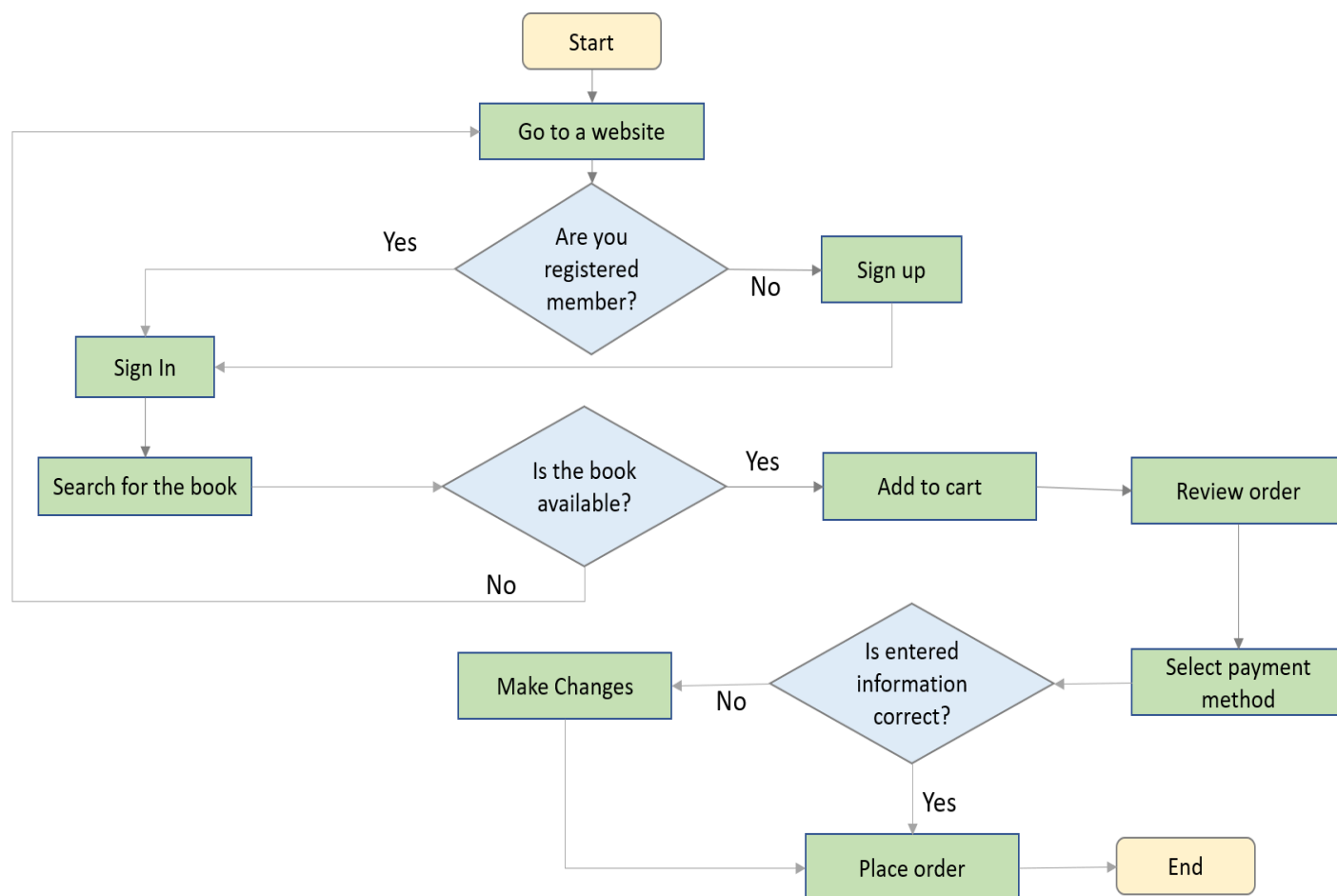


Fig 3.0 Buying Book Online



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