

## Programming Multiple Sprites in Scratch



In this lesson you will learn:  
To demonstrate actions like games, in Scratch.  
To program coordination between various Sprites.

Tejas: We want to animate two Sprites playing throw ball.

Moz: How is this game played?

Tejas: I throw the ball and Jyoti catches it. Next Jyoti throws and I have to catch it. Many players can also play this game together.

Moz: Good! Now, plan the Scratch project for the game.

Jyoti: Let us start with two players. So we need two Sprites.

Tejas: We need one more Sprite- the ball.

Jyoti: Let us have a playground as the Background.

Moz: Ok. Now list out what you need. Are you painting or importing the Sprites?

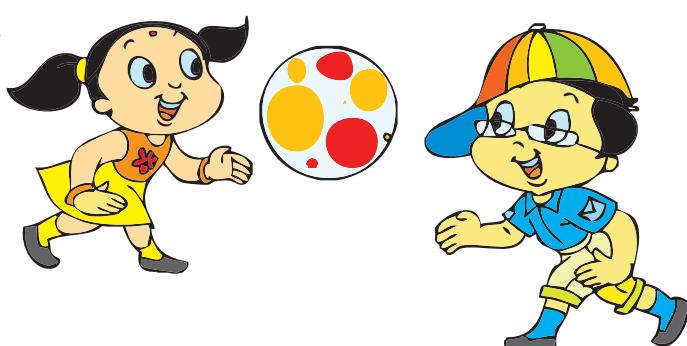
Tejas: We can import the ball and paint the two players.

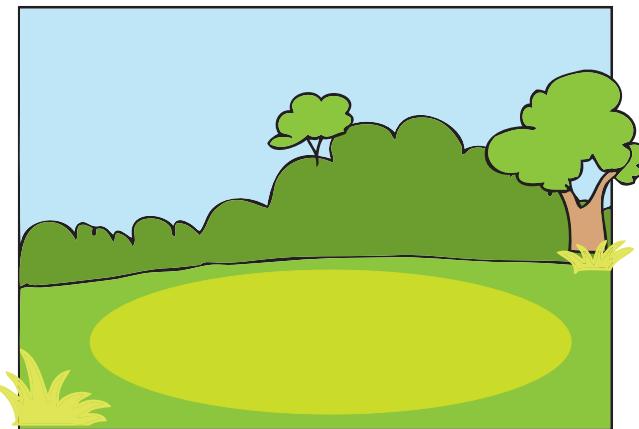
Jyoti: Let us import the 'playground' for the Background.



What we need?

- ◆ 3 Sprites (two players, one ball).
- ◆ One Background.





Moz: How does the game start?

Tejas: We have to make them stand opposite to each other at the start of the game.

Jyoti: Yes. And both have to stand at some distance apart.

Tejas: How can we make the Sprite stand in one position at the start of the game?

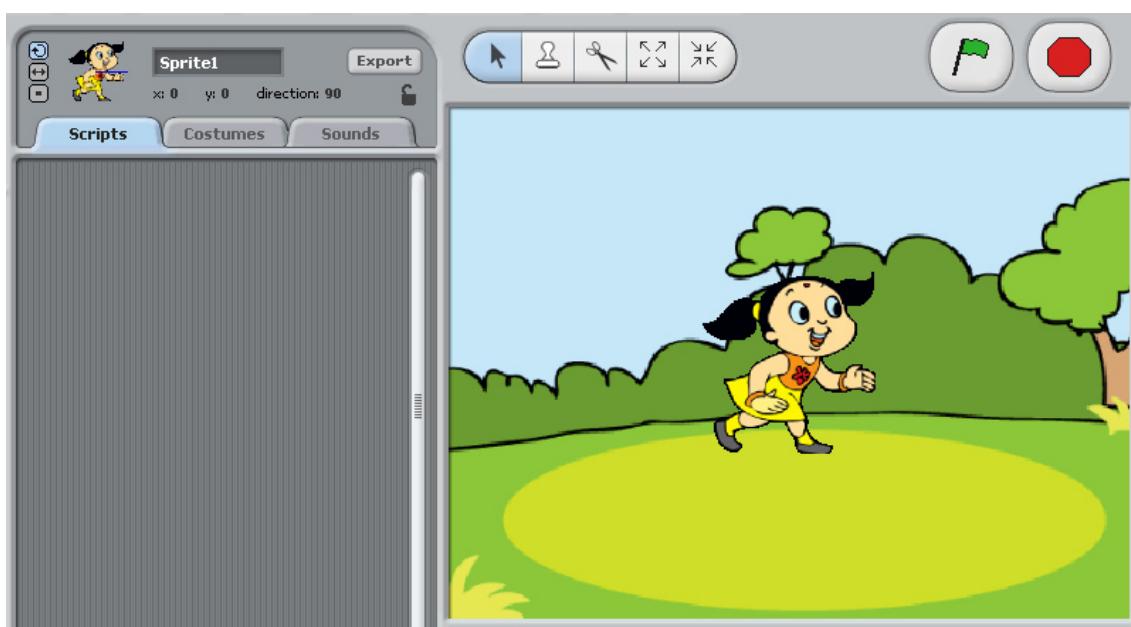
Moz (points to the **Current Sprite Info** window): Look at this. What is the number next to x and y?

Jyoti: x: 0 and y: 0.



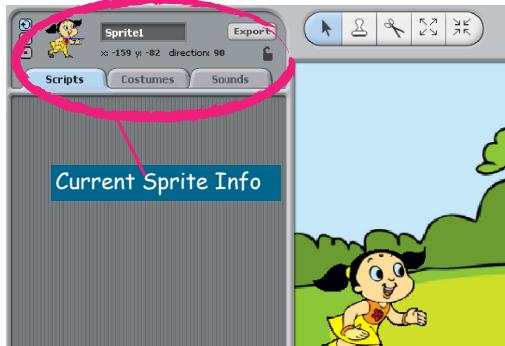
Moz: Where is the Sprite on the stage?

Jyoti: At the centre of the stage.



Moz: Now move the Sprite to the bottom-left corner of the stage. Check x and y again.

Tejas: Oh! Look, now it is x: -159 and y: -82.



- **Current Sprite Info** shows a Sprite's name, x-y position and direction.
- You can also type in a new name for the Sprite.
- Direction indicates how the Sprite will turn when it executes a move instruction.

Direction: 0 = up

Direction: 90 = right

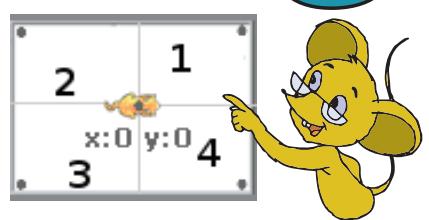
Direction: 180 = down

Direction: -90 = left



Jyoti: Why is x -159? What does it mean?

Moz: Look at this figure. Consider this as Scratch Stage. What do you observe?



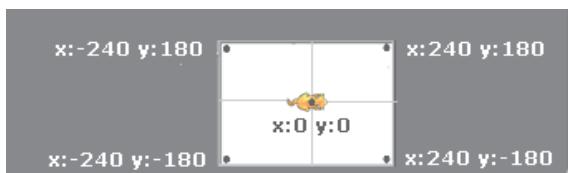
Jyoti: The stage is divided into four squares by a horizontal line and a vertical line.

Tejas: They are also numbered.

Moz: Good observation. The four squares are called four quadrants.



- The horizontal line is labeled the x-axis and the vertical line is labeled the y-axis. These two axes divide the Stage into four quadrants.
- The point at which the two axes meet is the center of the Stage and is called the **origin**. The origin has x:0 and y:0.



Moz: Now move the mouse pointer to each corner of the stage and note x and y values.

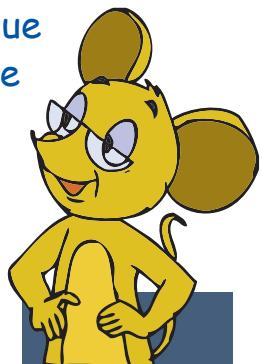
Tejas: The top right corner has x:240 and y:180 but the top left corner has x: -240 and y:180.

Moz: Correct. What else do you observe about x and y values?

Jyoti: As we move to the right from the origin, the x-value increases from 0 to 240. As we move left from the origin, the x-value changes from 0 to -240.

Tejas: Similarly, as we move up from the origin, the y-value increases from 0 to 180. As we move down from the origin, the y-value changes from 0 to -180.

Moz: Very good.



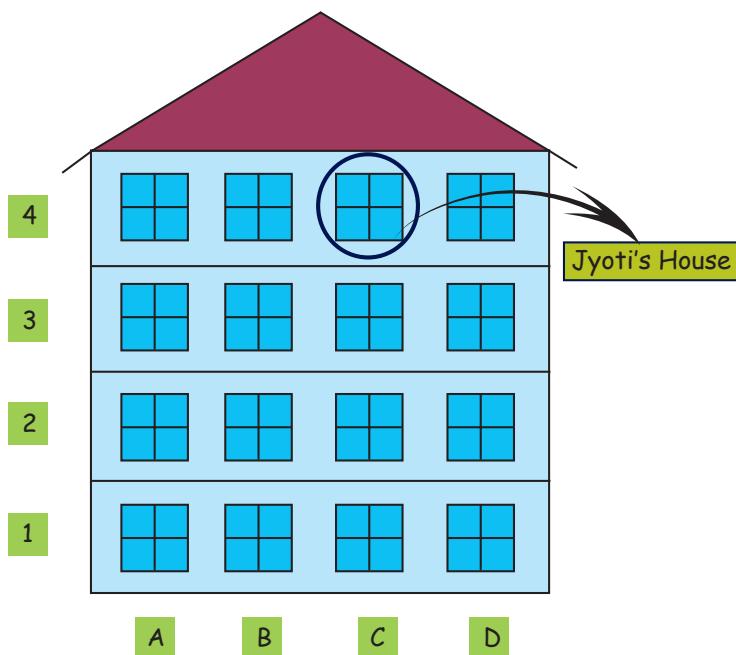
Each point on the stage is represented by two numbers. In Scratch, these numbers are called x and y values.

Moz: Let us look at an example of this in real life. Jyoti, you stay in a four stored building. Isn't it?

Jyoti: Yes. I stay on 4C. On each floor we have four houses. The horizontal line x, which represents houses on each floor, has values A, B, C, D. The vertical line y, which represents the floors, has values 1, 2, 3, 4.



Tejas: Then the address of the 3rd house in the second floor is 2C.



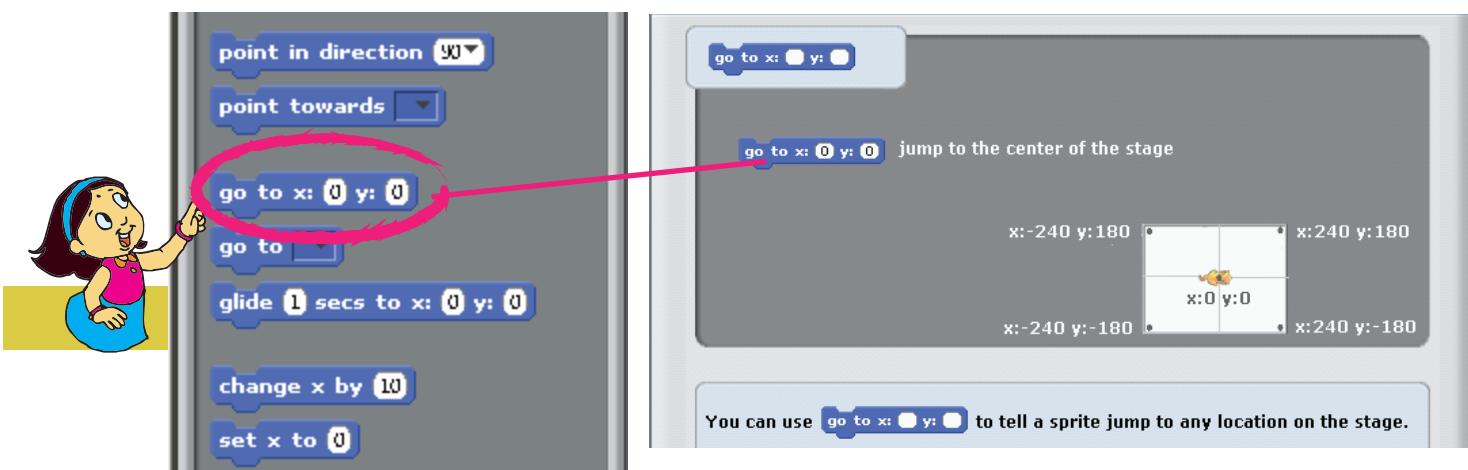
Moz: Good. Now, get back to the Scratch instructions.

Tejas: We have to move the Sprite to a particular position on the stage at the start of the game.

Moz: In which block will you find the movement instructions?

Jyoti: Motion block.

Jyoti (points to the instruction) : Let us try out this instruction.



Tejas and Jyoti use the go to x: \_\_\_, y: \_\_\_ instruction to position the first Sprite on Stage.

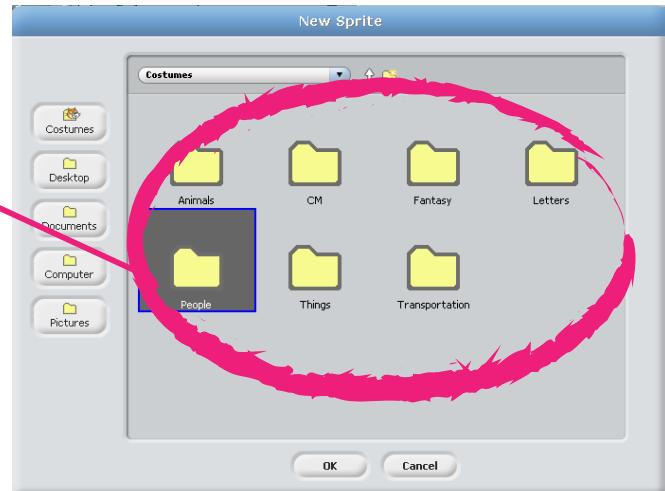


Jyoti: Now we have to import the second Sprite into the project.  
Steps to import a new Sprite:



Step 1: Click on the buttons to Import a new Sprite.

Step 2: The available list of folders are displayed. Select a folder to choose a new Sprite.





Step 3: Sprite inside the selected folder are displayed. Select the required Sprite.

The selected Sprite is added to the existing Sprite list.



Jyoti: The Script area is blank. What happened to the Script that we wrote.

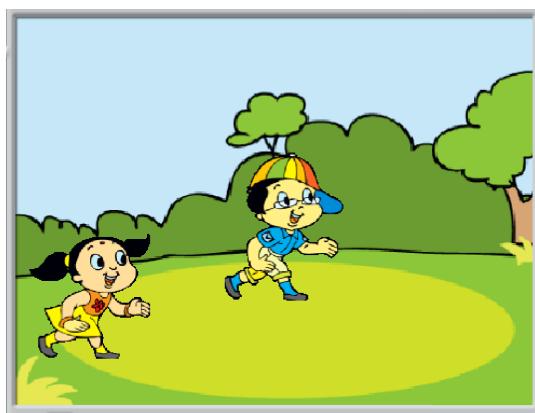
Moz: Click on Sprite1.

Jyoti: Oh! It is back.

Moz: Yes. But observe that this is the Script for Sprite1. You have to write a separate script for Sprite2.

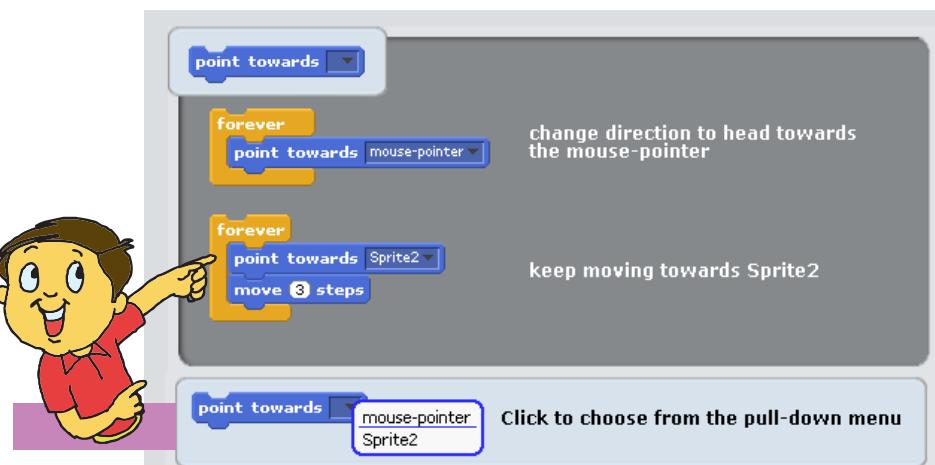
Jyoti: Ok. At the start we want both the Sprites to be positioned on the stage. The starting instruction has to be same.

Moz: Correct.

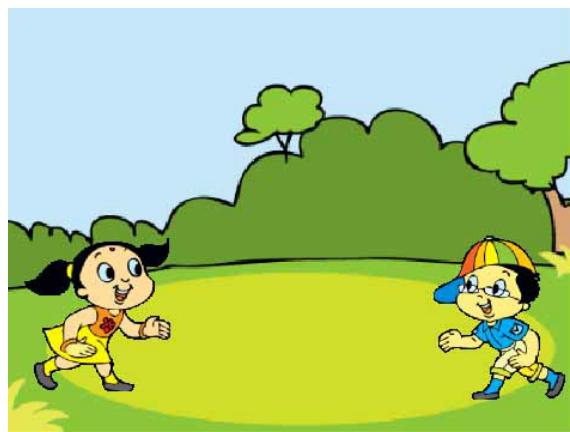


Jyoti: The Sprite2 has to face Sprite1. How do we change the direction of the Sprite? This is again a movement of the Sprite. Let us check in the Motion block.

Tejas (points to the instruction block): We can use this.



Tejas and Jyoti enter the following instructions to position the second Sprite on the stage.



Tejas: Now we have to import the ball Sprite (Sprite3).

Jyoti: Next let us place the ball in the hand of Sprite1.

Tejas uses the mouse and moves the ball Sprite into the hands of Sprite1. Then he points to the x and y position of the ball Sprite displayed in the **Current Sprite Info** window.



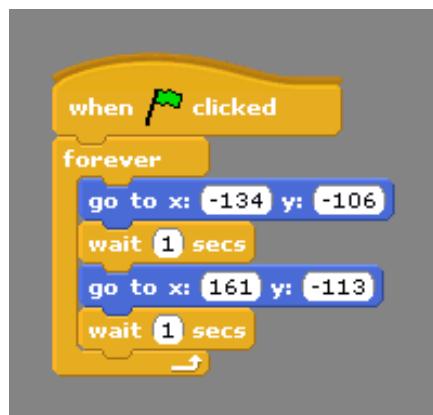
Tejas: The x and y position of the Sprite is displayed here, x: -134 and y:-106.

Jyoti: When Sprite1 throws the ball then the ball has to be in the hands of Sprite2.

Tejas (moves the ball Sprite into the hands of Sprite2): The x and y position of the Sprite displayed here is x: 161 and y:-113.

Jyoti: To repeat the actions we have to use instructions from Control block.  
Moz: Good. Now, write the Scripts for the ball Sprite.

Tejas and Jyoti enter the following instructions for the ball Sprite to animate the game of throw ball.



Tejas and Jyoti click on and are happy to see the two Sprites playing throw ball on stage.

Jyoti: We will give it a title "Catch me and play". Let us glide this ball over the title. Then make it jump into the hands of Sprite1.

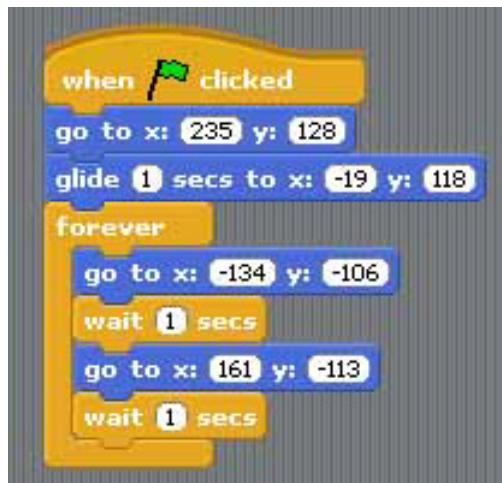
Tejas: That is a good idea. We have to add one more Sprite for the title. I think we have to use Paint in Scratch to create the title.

Jyoti and Tejas create the title Sprite and place it on stage. The ball Sprite instruction block is modified.



Stage of "Catch me and play" animation

The modified instructions of ball Sprite.



Moz: Let us take a break and play throw ball outside.

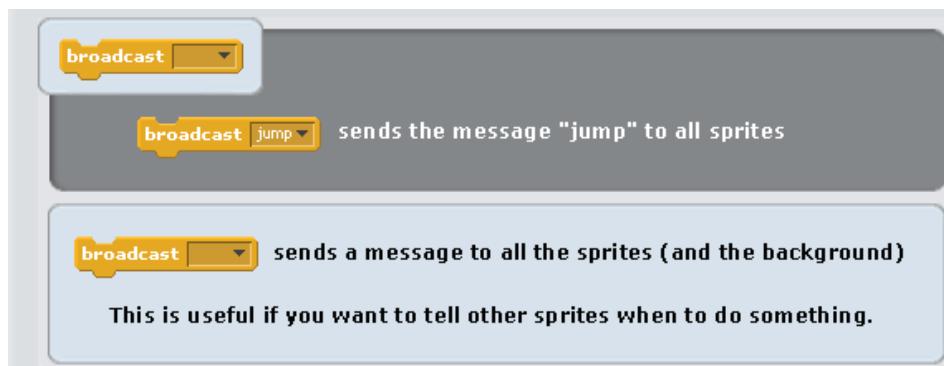
Tejas: When we were playing outside the ball sometimes goes to the left or right of the player. But still we catch it. Can we make the Sprites do the same in the animation?

Moz: Yes. You can. Suppose I am throwing the ball. How do you know that you have to move to the right or left to catch the ball?



Tejas: When I look at the way the ball is coming, I know if I have to move to the right or left.

Moz: Correct. We need to provide this signal in the program by sending a message all the Sprites. See the instruction in Control block.



Tejas: What does Broadcast do?

Moz: Broadcast sends out a signal to all the Sprites through a message and then waits for some action from other Sprites.

Jyoti: It is just like we get a signal when the ball is thrown to the left or right.

Tejas: Ok. Then let us make ball Sprite broadcast "left".

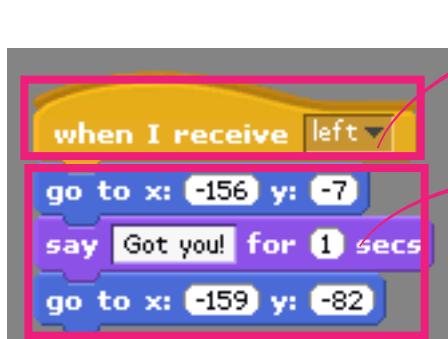


A signal is sent to other Sprites through the message "left".

In Scratch a signal is sent to other Sprites through a message using the instruction **Broadcast**.

SKILLS

Jyoti: Then Sprite2 has to receive the message and take action.



The signal is received by Sprite2.

The actions of Sprite2 after receiving the signal.

Tejas: We can also use similar instructions to control the movement of Sprites to other positions.

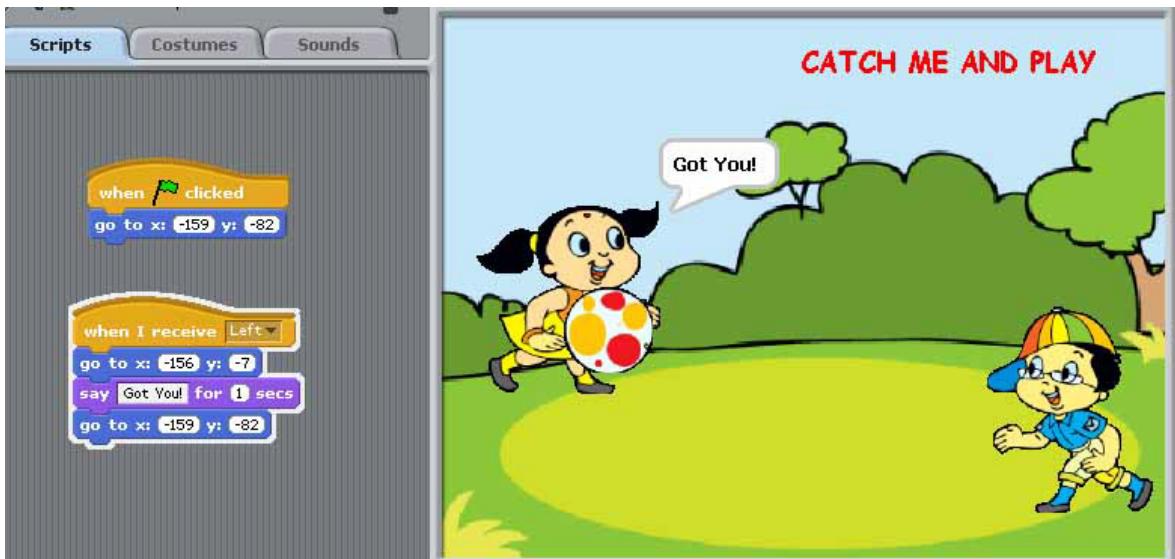
Jyoti: I see that these instructions help us to coordinate actions of multiple Sprites.

In Scratch, the instructions **Broadcast** and **When I receive** enable us to coordinate the actions of multiple Sprites.

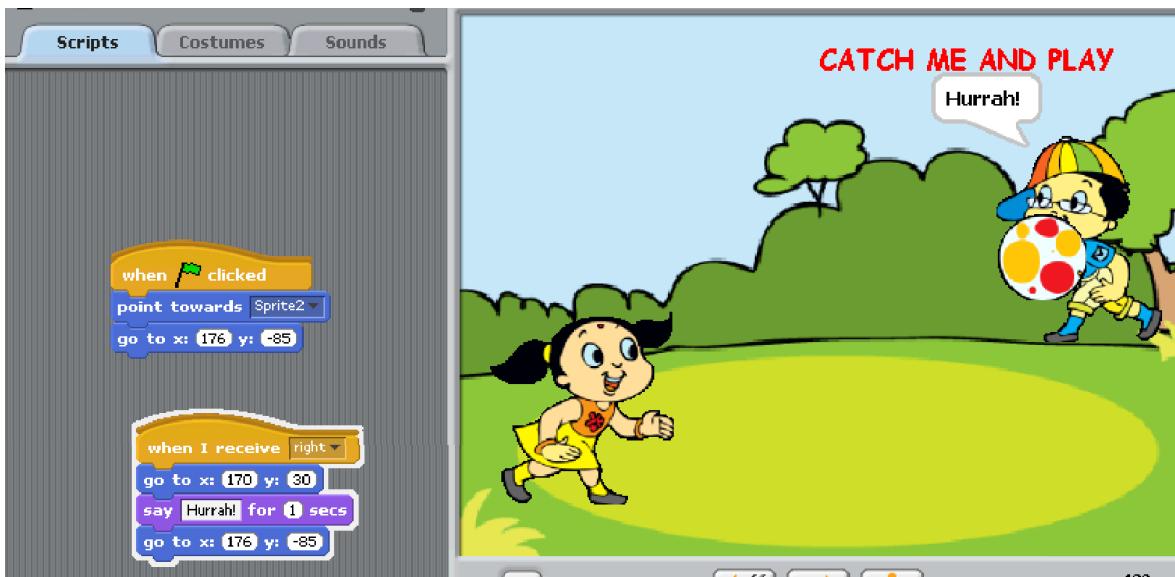
SKILLS

Final scripts of "Catch me and play".

Scripts for Sprite1 along with the Stage.



Scripts for Sprite2 along with the Stage.



Title Sprite



## Scripts for the Ball Sprite along with the Stage.



Tejas: Wow! The two Sprites are playing throw ball.

Jyoti: We will write more programs like this.

Moz: Yes. You can do some more interesting programs in Scratch next time.

Chin Chinaki...

### Learning Outcome

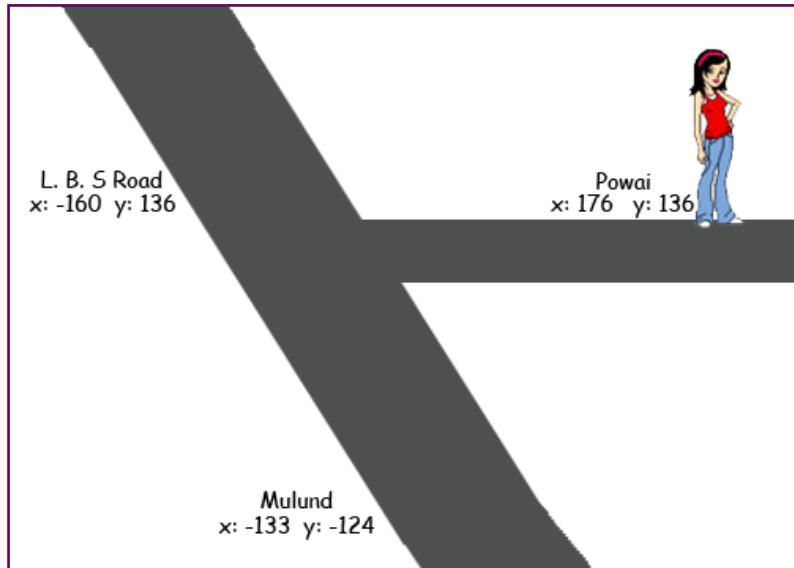
After you have studied this lesson,  
you will be able to:

- Write a program with multiple Sprites.
- Coordinate the actions of the various Sprites.
- Use Control blocks appropriately.
- Write a program for animation.

# WORKSHEETS



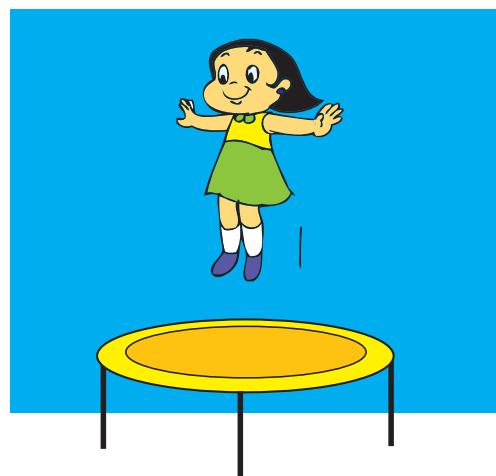
- 1.** Shilpa is at Powai. She has to go via L.B.S Road to Mulund. The x-value and y-value shows positions of Powai, L.B.S Road, Mulund are given below. Write a program in Scratch for Shilpa to go from Powai to Mulund via L.B.S Road.



Hint: The starting instructions are given below. Complete the program and run it in Scratch.



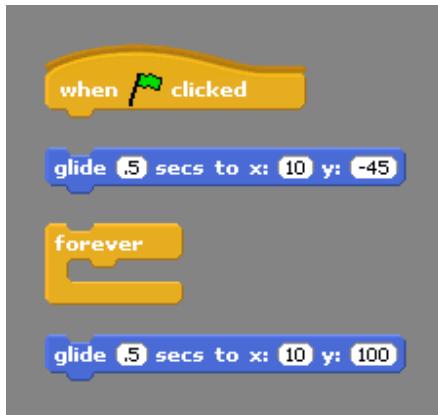
- 2.** Vishal is programming an animation for his sister Jyotsna. He wants to show her jumping on the trampoline. Help him do the following three activities.



# WORKSHEETS



- a. Arrange the following instructions on the right hand side to make Sprite Jyotsna, jump on the trampoline.



- b. Vishal knows that following instructions are required to make Jyotsna do a somersault. Match the command with the correct action.

	Moves Sprite smoothly to a specified position over specified length of time.
	Changes Sprite's appearance by switching to different Costume.
	Runs the blocks inside over and over.
	Runs Script below when green flag is clicked.

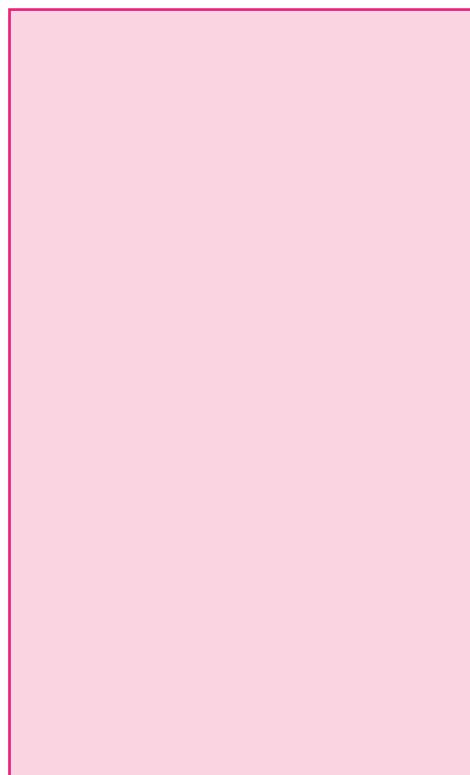
# WORKSHEETS



- c. The following instructions make Jyotsna do a full somersault from the right when right arrow key is pressed, and a full somersault from the left when left arrow key is pressed. Put the instructions together to make Jyotsna do somersault.

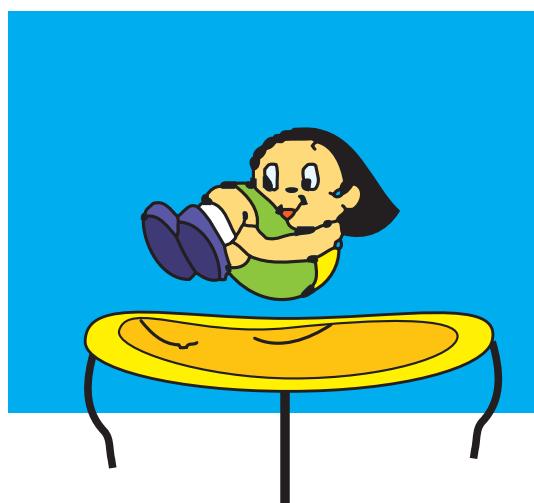
```

when right arrow key pressed
repeat (24)
  turn (15) degrees
forever
  glide (.5 secs to x: 10 y: -45)
  glide (.5 secs to x: 10 y: 100)
when green flag clicked
repeat (24)
  turn (-15) degrees
when left arrow key pressed
  
```



Hint:

	<p>Runs instructions below it when the specified key is pressed.</p>
--	--



# WORKSHEETS



### 3. Match the following instructions with their blocks:

<pre>glide 1 secs to x: 0 y: 0 turn ⚡ 15 degrees go to x: 0 y: 0</pre>	<p>Looks</p>
<pre>forever if [ ] when space key pressed wait 1 secs broadcast [ ] and wait</pre>	<p>Motion</p>
<pre>set volume to 100 % play sound meow until done set instrument to 1</pre>	<p>Control</p>
<pre>switch to costume costume1 say Hello! for 2 secs next background</pre>	<p>Pen</p>
<pre>pen down set pen color to blue change pen size by 1</pre>	<p>Sound</p>

# WORKSHEETS



- 4. Meetu monkey again! Complete the sequence of actions and instructions given in a), b) and c) to help Martha monkey jump on the stones and reach the bananas. You are given the following:**

Sprites - Bananas and Martha monkey.

Background - A stream with the stones and the banana tree on the other side of the stream.

x, y positions of bananas and stones.

- a. Fill in the blanks for Step 1 and Step 2:

Step 1: \_\_\_\_\_ the background into the project.

Step 2: Program the \_\_\_\_\_ Sprite to place it on the banana plant.

When flag clicked

go to x: \_\_\_\_ y: \_\_\_\_

- b. Program the Sprite Martha monkey to jump on the stones: Write the program block for Step 3 using the x-value and y-value given in the following picture.

Hint: The first three instructions are given to you. Complete the block.

When flag clicked

go to x: -115 y: -126

wait 1 secs

go to x: \_\_\_\_ y: \_\_\_\_

wait \_\_\_\_ secs

go to x: \_\_\_\_ y: \_\_\_\_

wait \_\_\_\_ secs

go to x: \_\_\_\_ y: \_\_\_\_

wait \_\_\_\_ secs

go to x: \_\_\_\_ y: \_\_\_\_

wait \_\_\_\_ secs

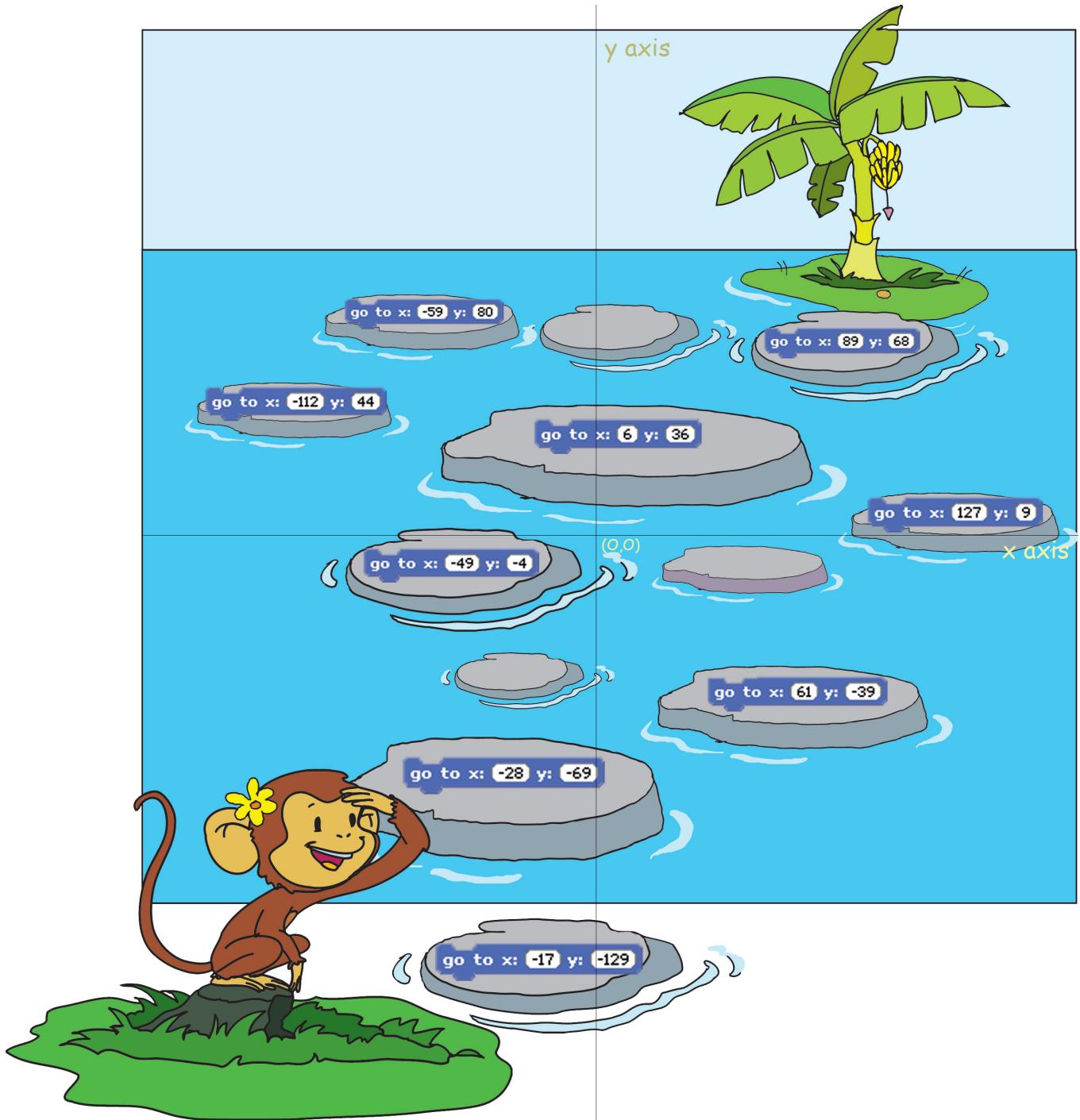
go to x: \_\_\_\_ y: \_\_\_\_

wait \_\_\_\_ secs

go to x: \_\_\_\_ y: \_\_\_\_

wait \_\_\_\_ secs

# WORKSHEETS



- c. Add the instructions to Banana Sprite to make the bananas move to the hands of the monkey.

Hint: Find the correct x-value and y-value of Meetu and write these instructions.



Open the following Scratch projects and do the activities.

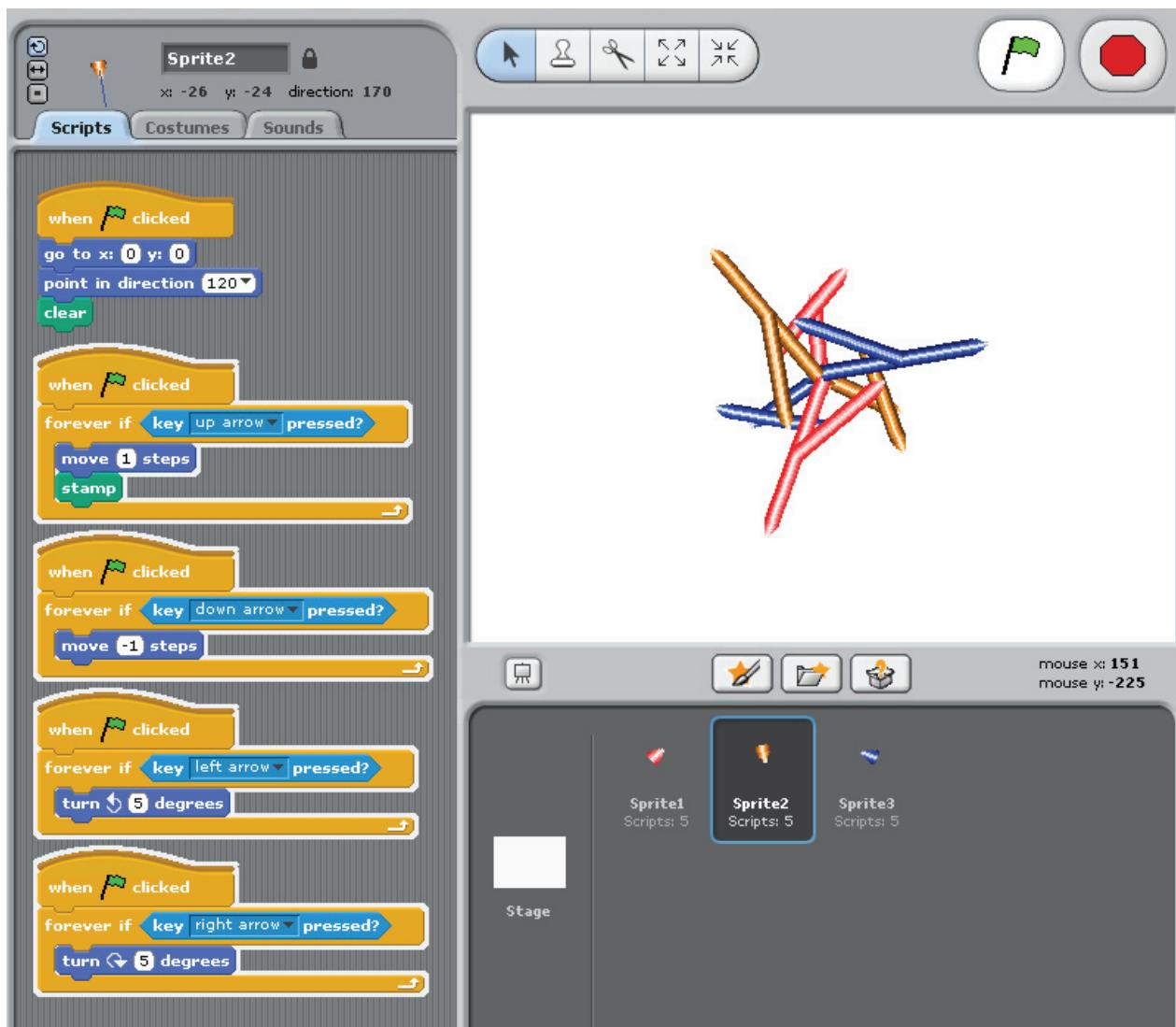
1. **Kaleidoscope:** Use the arrow keys to move around and draw a symmetrical pattern.

Follow these steps to start this project:

Scratch ---> Projects ---> Games ---> Kaleidoscope

Activities to do:

- ◆ Edit the Costumes of the Sprites to draw using different shapes.
- ◆ Change the x and y position.
- ◆ Use the 'change colour effect' block to make different colours.
- ◆ Add more key controls.





## 2. Monkey Dressup: Click the clothes to adorn the monkey.

Follow these steps to start this project:

Scratch ---> Projects ---> Interactive Art ---> Monkey DressUp

Activities to do:

- ◆ Change the x and y position.
- ◆ Use the broadcast option.
- ◆ Add key controls.



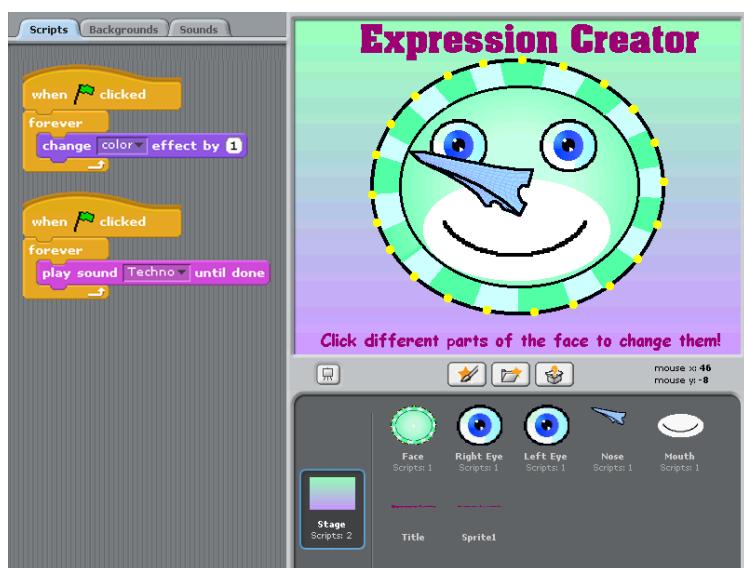
## 3. Expression Creator: Click on different parts of the face to change them.

Follow these steps to start this project:

Scratch ---> Projects ---> Interactive Art ---> Expression Creator

Activities to do:

- ◆ Make changes to the Costume of each Sprite.
- ◆ Make the eyes glide to particular x and y position.





4. Write a project in Scratch that shows the game of badminton.

Hint:

This is similar to the ball game described in the lesson.

1. You will need Sprites for the two players, play items.
2. Use the following commands under motion block:

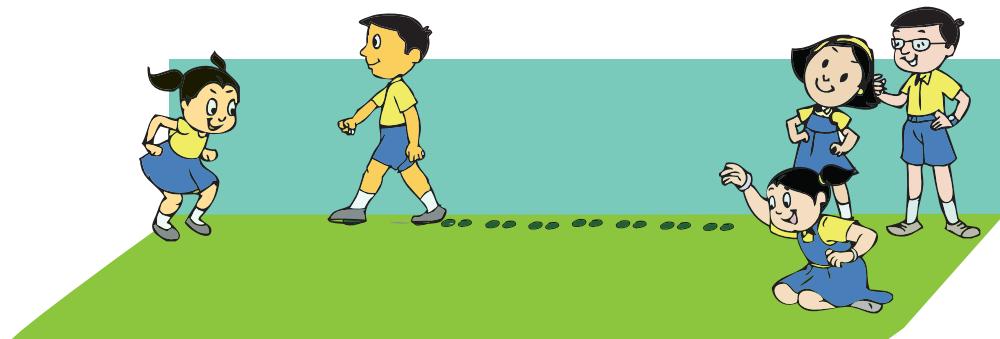
point in direction (90°)

go to x: 0 y: 0

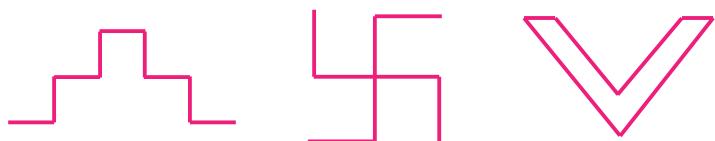
glide 1 secs to x: 0 y: 0

### Group Activity

Divide the class into groups of five each. Create or import two Sprites for the two students and write a script for them to do an activity of your choice. Use your imagination to make them do actions under motion and control blocks.



While acting as Sprites, you can draw different shapes, for example:



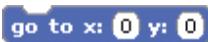
### Project

Do project 2 given in lesson 7.

### Explore!

1. Open Scratch and click on the tab 'want help?' [You will find it in the top row]. Now click on help screens and read to know the function of different instruction blocks.
2. How will you draw a flower, a heart, circle, etc, using Scratch?

- The purpose of this lesson is to teach students how to plan and write a program in Scratch. It will enable students to think logically and plan an activity. Besides, they become confident in controlling the technology, by writing programs they can make the computer do something.
- Start the class by revising the Scratch concepts taught in Level 3 of Computer Masti. Revise the different blocks and instructions. You can ask the students to write a small project to refresh their memory of what they already know about Scratch.
- Tell the students that they will now learn more interesting activities using Scratch. You can say that they will learn to do animations to arouse their curiosity.
- Start Scratch and click on the motion block so that students can look at all the instructions under it. Ask them to read it. Students are already familiar with move, turn and point instructions. As they go through the list, draw their attention on the instruction:

- Use this opportunity to explain what are x and y axis, origin and the concept of quadrants. Refer page numbers 52 and 53 of the lesson for this. Explain that the stage in Scratch is divided into four quadrants. The horizontal line represents x-axis and the vertical line y-axis. The x-value varies from -240 to 240 and y-value varies from -180 to 180. Ask them to note the x and y values for the Sprite. Drag the Sprite and ask them to note the change in x and y values. Now demonstrate how to make the Sprite move by changing the x and y values.
- Get two Sprites and write scripts for the two so that the program runs with coordination.

You can use various control blocks such as,



- Write the Script for the activity described in the lesson and demonstrate the use of the different instruction blocks covered in the lesson.
- Emphasise that it is important to plan the program on paper before going to the computer. Ask the students to write the script for the Scratch project in their notebook. Ensure that they think through the entire activity before they start writing the project on the computer. Of course, they can go back and forth on this and make changes, but this exercise will help them to plan the project appropriately.
- Summarise the lesson and give the students activities to practice.

Further Reading:  
<http://info.scratch.mit.edu/Support>