In this lesson you will learn
To demonstrate live actions like games, in Scratch.
To program coordination between various Sprites.
To synchronize the actions of 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. Next Jyoti throws and I have to catch it. Many players can also play this game together.
Moz: Oh! I got it. Plan the scratch project for the game before you start building the blocks.
Jyoti: Let us start with two players. So we need two sprites.
Tejas: We need one more sprite. The throw 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.

Step 1: Sprites, background required for the animation.
• 3 Sprites (two players, one throw ball)
• One Background
Moz: How does the game start?
Tejas: We have to make them stand opposite 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 center of the stage.
Moz: Now move the sprite to the top-left corner of the stage. Check x and y again.
Tejas: Oh! Look, now it is x: -100 and y: 97

Tejas and Jyoti move the Sprite to various positions on the stage. They find that x and y values keep changing as per the position of the Sprite.

Current Sprite Info shows a Sprite’s name, x-y position, direction.
You can type in a new name for the Sprite.
The Sprite’s direction indicates which direction the Sprite will move when it runs a move block
(0=up, 90=right, 180=down, -90=left).

Moz: Now, you have to move the Sprite to this position. In which block will you find the movement instructions?
Jyoti: Motion block.
Jyoti (points to the instruction): Here it is.
Tejas and Jyoti enter the following instructions to position the first Sprite on stage.

Jyoti: Now we have to import the second Sprite into the project. Jyoti does the following to import the second Sprite:

Motion block has instructions to make the Sprite move, such as number of steps to take, direction of motion, etc.

Skill: write skill here. (Not yet given.)
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.
Tejas: Let us position the second Sprite at the bottom right corner of the stage.
Jyoti: The Sprite has to face sprite 1. How do we change the direction of the Sprite? This is again a movement of 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.

```plaintext
when [green] clicked
  go to x: -139 y: 110
  point towards Sprite1
```
Jyoti: Next let us place the ball in Sprite1’s hand.  
Tejas moves the mouse around the stage. Then points to the x, y position of mouse displayed below the stage. 
Tejas: Mouse position on the stage is displayed here. Let us move the mouse pointer on the hands of Sprite1, mouse pointer position is x: -171 and y:73.

Jyoti: When Sprite1 throws the ball then the ball has to be in Sprite2’s hand. 
Tejas (moves the mouse pointer to sprite2’ hand): The mouse pointer position is x: 133 and y: -84.
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 (the green flag - put icon here) and start jumping around happy to see the two Sprites playing throw ball on stage.

Jyoti: Let us give it a title “Catch me and play”.
Tejas: Why “Catch me and play”?  
Jyoti: 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. 
Moz: Correct.
Tejas and Jyoti create the title Sprite and place it on stage. The ball Sprite instruction block is modified.
The modified instructions of ball Sprite.

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

Tejas: When we were playing the ball sometimes goes to the left of right of the player. But still we catch it. Can we 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: We get a signal as the ball moves. When I look at the way the ball is coming I know I have to move to the right or left.
Moz: Correct. So let us see how we can give the signal. See the instructions in control block. Broadcast sends out a signal to all the Sprites. You can write an action for the signal received.
Tejas: Sprite1 can broadcast “left”.
Jyoti: Sprite2 can then move to the left and catch after receiving “left”.
Tejas: We can also do the same for right and some other position.
Moz: Correct.

Coordination between multiple Sprites can be achieved by broadcast and when I receive broadcast and wait allows synchronization.

**CONCEPTS**
Coordination between multiple sprites can be achieved by broadcast and when I receive, broadcast and wait allows synchronization.

Final scripts of “Catch me and play”

**Sprite 1**

- `when [ ] clicked`
- `go to x: -171 y: 73`
- `when I receive [ ]`
  - `go to x: -95 y: 111`
  - `say Got you! for 2 secs`
  - `wait 1 secs`
  - `go to x: -171 y: 73`

**Sprite 2**

- `when [ ] clicked`
- `go to x: 133 y: -84`
- `when I receive [ ]`
  - `go to x: 178 y: -9`
  - `say Hurray! for 0.5 secs`
  - `wait 1 secs`
  - `go to x: 133 y: -84`
A few snapshots of stage for the above scripts: Put them along with the scripts. Circle the instructions being executed when the snapshot was taken.

Swati: We have to put the final stage too. But I will take these after Kaumudi gives me sprite illustrations. (Not yet given.)
Lesson Outcome

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

- Remain
1. Bharat is at Powai. He has to go via M.G Road to Mulund. The \( x,y \) positions of Powai, M. G. Road, Mulund are given below. Write a program in scratch for Bharat to go from Powai to Mulund via M.G.Road.

M. G. Road  
\[ x: -160, y: 136 \]

Powai  
\[ x: 176, y: 136 \]

Mulund  
\[ x: -133, y: -124 \]

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

2. Tejas is programming an animation for his sister Jyotsna. She has given two of her photographs. Tejas scanned the photographs and imported them as costumes for his program.

Kaumudi: Two pictures of a girl - one with hands down and the other with hands stretched to the side. (Not yet given.)
a. Arrange the following instructions in the correct sequence to make Sprite Jyotsna, jump on the trampoline.

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="glide 0.5 secs to x: 20 y: 150" /></td>
<td>Moves Sprite smoothly to a specified position over specified length of time.</td>
</tr>
<tr>
<td><img src="image" alt="when clicked" /></td>
<td>Runs Script below when green flag is clicked.</td>
</tr>
<tr>
<td><img src="image" alt="switch to costume costume" /></td>
<td>Changes Sprite’s appearance by switching to different costume.</td>
</tr>
<tr>
<td><img src="image" alt="forever" /></td>
<td>Runs the blocks inside over and over.</td>
</tr>
</tbody>
</table>

![Diagram](image)
b. 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. But the instructions are not in the correct sequence. Put them in the correct sequence and run the program in scratch.

Hint:

Runs script below when specified key is pressed.

Kaumudi: Two pictures. One with hands stretched and the other with hands on the side, and a trampoline. Here is a picture to draw the trampoline etc., (Not yet given.)
3. Martha monkey again! Yes. 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
   goto x: ____ y: ____

b. Program the Sprite Martha monkey to jump on the stones:
   Write the program block for Step 3 using the x, y positions given in the following picture.
   Hint: The first three instructions are given to you. Complete the block.
   When flag clicked
   go to x: -87 y: -108
   wait 1 secs
c. Add the instructions to Banana sprite to make the bananas move to the hands of the monkey.

Hint: Find the correct x, y position and write these instructions.
### 4. Match the following:

<table>
<thead>
<tr>
<th>Looks</th>
<th>Motion</th>
<th>Control</th>
<th>Pen</th>
<th>Sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>glide 1 ease to x y</td>
<td>turn (15) degrees</td>
<td>set volume to 100%</td>
<td>switch to costume costume1</td>
<td>pen down</td>
</tr>
<tr>
<td>go to x y</td>
<td></td>
<td>play sound meow until done</td>
<td>say Hello! for 2 secs</td>
<td>set pen color to</td>
</tr>
<tr>
<td>forever if</td>
<td>when space key pressed</td>
<td></td>
<td>next background</td>
<td>change pen size by 1</td>
</tr>
</tbody>
</table>
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 → Games → 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:

i. Make changes to the costume of each sprite.

ii. Make the eyes glide to particular x and y position.
4. Write a project in Scratch that shows the game of badminton.
   Hint:
   1. You will need costumes for the two players, play items.
   2. Use the following motion blocks --- point in direction, go to x and y position,
      glide __sects to x: __y:__.

Group Activity
Divide the class into groups of five each. Make two students sprite 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 such as move ____ steps.

Explore!
1. Open Scratch and click on the tab ‘want help?’
   [You will find in the top row]. Now click on help
   screens and read to know the function of different
   instruction blocks.
Teacher’s Corner

- 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 the Scratch program 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, go to x: __ y:__

- Explain what are x and y coordinates and how they determine the position of the sprite. 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 well coordination. You can use of various control blocks such as when __key is pressed, when Sprite 1 is pressed, broadcast.

- Write the script for the activity described in the lesson and demonstrate the use of the different instruction blocks covered in the lesson.

- Summarize the lesson and give the students activities to practice.

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