Topic	DESIGN PONG GAME	
Class Description	**Students use their knowledge of sprites, object properties and functions to create and assign game behavior to the objects in the Pong Game.**	
Class	**PRO-C4**	
Class time	**45 mins**	
Goal	• Create the 2 paddles and the ball as sprite objects in the game. • Assign game behavior to the paddles and the ball.	

Resources Required	• Teacher Resources
	  ○ Code.org login
	  ○ Laptop with internet connectivity
	  ○ Earphones with mic
	  ○ Notebook and pen
	• Student Resources
	  ○ Code.org login
	  ○ Laptop with internet connectivity
	  ○ Earphones with mic
	  ○ Notebook and pen	

Class structure	**Warm Up - Slide show option** **Teacher-Led Activity** **Student-Led Activity** **Wrap Up - Slide show option**	**15 Mins** **8 Mins** **30 Mins** **5 Mins**

WARM UP SESSION - 15 mins

Teacher starts slideshow  **from slides 1 to 16**

Refer to speaker notes and follow the instructions on each slide.

Activity details	Solution/Guidelines
Hey <student name>. How are you? Nice to see you! Let's learn something new today, but before we start, do you remember what we are going to learn today? **Run the presentation from slide 1 to slide 8.** **Following are the warm up session deliverables:** 1. Help student recall different concepts covered so far 2. Relate each function and property to the objects in the pong game	**ESR**: Hi, thanks. Yes! *Student recalls from the last class what the teacher mentioned regarding what will be covered in the upcoming session.* Click on the slide show tab and present the slides.
QnA Session	
Question	**Answer**

Consider the following code snippet for ball's movement in the Pong game.
 	
if (keyDown(LEFT_ARROW)) {
ball.velocityY = -4;
}
 	
Which of the option represents the correct output?
 	
A. Ball will move up
B. Ball will move left
C. Ball will move down
D. Ball will move right
	A.

Continue the warm up session	
Activity details	**Solution/Guidelines**
Run the presentation from slide 9 to slide 16 to set the problem statement. **Following are the warm up session deliverables:**	Narrate the story by using hand gestures and voice modulation methods to bring

• Encourage the student to identify the code of what is known. • Encourage the student to think of the solution for unknown problems one by one.	in more interest in students.
Teacher ends slideshow 	
TEACHER-LED ACTIVITY - 8mins	
Teacher Initiates Screen Share	
CHALLENGE	

Activity details		**Solution/Guidelines**
Step 2: Teacher-led Activity (10 min)	*Brainstorm with the student on each object, their behavior and how to code for it in the game.* *Teacher opens the finished Pong game ([FULL GAME] Pong) on the screen.* What are the objects in our game?	**ESR:** The two paddles- the computer paddle and the player paddle - and the ball.
	Let's talk about the behaviour of each object in our game. Let's start with the player paddle. How will you create the player paddle object in the game? What is the x position of the player paddle? Is it fixed or does it change?	**ESR:** Using a sprite object. **ESR:** It's fixed.

	How will we assign the x position to the paddle? What about the y position of the player paddle? Does it change? How does it change? How will we assign the y position to the paddle? Awesome!	**ESR:** playerPaddle.x = 390 **ESR:** It changes with the mouse pointer. **ESR:** playerPaddle.y = World.mouseY
	Let's start talking about the ball. How will you create the ball object in the game? When does the ball start moving? How will we give instructions to the computer to do that? ***Hint:** We did this in conditional programming. GREAT! What are the other behaviors of the ball? How do we do that in the game? AWESOME!	**ESR:** Using a sprite object. **ESR:** When the user presses space. **ESR:** We will give velocity to the ball when the user presses the "SPACE" key. **ESR:** The ball bounces off the walls and the paddles. **ESR:** Using the bounceOff() function of the sprite.

	Now finally, let's talk about the computer paddle. How will we create it? What is the x position of the computer paddle? Is it fixed or moving? How will we assign the x position of the computer paddle?" What is the y-position of the computer paddle? Is it fixed or changing? How is it changing? So, how do we assign the y position of the paddle. ***Hint**: The y position of the paddle is always the same as some other object in the game.	**ESR:** Using a sprite object. **ESR:** It is fixed. **ESR:** computerPaddle.x = 10; **ESR:** It is changing. **ESR:** It is changing wherever the ball is moving. **ESR:** The y position of the paddle is the same as the ball's. We can assign the y position of the paddle by computerPaddle.y = ball.y
	Amazing! I think we have everything to get started on designing the game. Let's start. You can share your screen with me and we can start making the game.	*The student shares the screen.*
Teacher ends slideshow 		
Teacher Stops Screen Share		
STUDENT-LED ACTIVITY - 8mins		

- **Ask Student to press ESC key to come back to panel**
- **Guide Student to start Screen Share**
- **Teacher gets into Fullscreen**

ACTIVITY

1. **The student creates the game objects of the Pong Game and assigns their game behavior.**

Step 3: Student-Led Activity (20 min)	*Help the student write code for each object and their behavior.* Let's name our project as "Pong Stage 2".	*The student opens Student Activity 1, presses on Remix and names the new project as Pong Stage 2.*
	Let's create paddles and the ball using sprites and place them on the game. Let's draw them on the screen. *Guide the student to create and draw the game objects.*	*The student uses **createSprite()** to build sprite objects for the paddles and the ball.* *Student draws the sprite inside the **draw()** function.*

```
var playerPaddle = createSprite(380,190,10,70);
var computerPaddle = createSprite(10,190,10,70);
var ball = createSprite(200,200,10,10);

function draw() {
  drawSprites();
}
```

	Let's give the **background("white")** to our game and then assign the position properties to our player paddle object.	*The student assigns x and y position to the player paddle object and sets the **background("white")**.* *Student runs code to check.*

```
var playerPaddle = createSprite(380,190,10,70);
var computerPaddle = createSprite(10,190,10,70);
var ball = createSprite(200,200,10,10);

function draw() {
  background("white");

  playerPaddle.x = 380;
  playerPaddle.y = World.mouseY;

  drawSprites();
}
```

	Let's assign the behavior to our ball. When does the ball start moving? What do we need to do to make the ball move on a press of the SPACE key?	**ESR:** We can use conditional programming **ESR:** *The student writes code to assign this behavior to the ball using conditional programming.* *He/She runs the code to check.*

```
var playerPaddle = createSprite(380,190,10,70);
var computerPaddle = createSprite(10,190,10,70);
var ball = createSprite(200,200,10,10);

function draw() {
  background("white");

  playerPaddle.x = 380;
  playerPaddle.y = World.mouseY;

  if (keyDown("space")){
    ball.velocityX = 2;
    ball.velocityY = 3;
  }

  drawSprites();
}
```

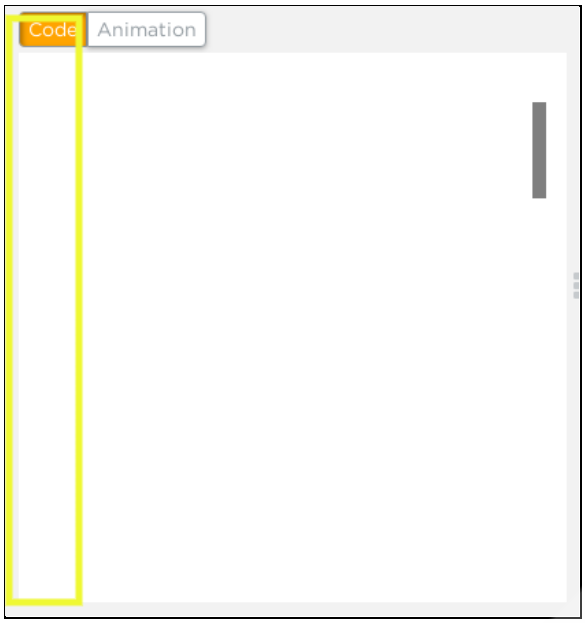
	We are doing very well so far. Let's make the ball bounce-off the walls and the paddle. *Guide the student to create the edge sprites and make the ball bounceOff the topEdge, bottomEdge and the two paddles.*	*The student writes code to create Edges and make the ball bounce off the topEdge, bottomEdge and the paddles.* *He/She runs the code to check.*

```
var playerPaddle = createSprite(380,190,10,70);
var computerPaddle = createSprite(10,190,10,70);
var ball = createSprite(200,200,10,10);

function draw() {
  background("white");

  playerPaddle.x = 380;
  playerPaddle.y = World.mouseY;

  if (keyDown("space")){
    ball.velocityX = 3;
    ball.velocityY = 4;
  }

  createEdgeSprites();

  ball.bounceOff(topEdge);
  ball.bounceOff(bottomEdge);

  ball.bounceOff(playerPaddle);
  ball.bounceOff(computerPaddle);

  drawSprites();
}
```

	Now it is time to assign AI to our computer Paddle! Let's do that. Let's assign the x and y position to our computer Paddle.	*Student writes code to assign x position and y position to the computer paddle.* *The student plays the game to check if the game works as predicted.*

```
var playerPaddle = createSprite(380,190,10,70);
var computerPaddle = createSprite(10,190,10,70);
var ball = createSprite(200,200,10,10);

function draw() {
  background("white");

  playerPaddle.x = 380;
  playerPaddle.y = World.mouseY;

  computerPaddle.x = 10;
  computerPaddle.y = ball.y;

  if (keyDown("space")){
    ball.velocityX = 3;
    ball.velocityY = 4;
  }

  createEdgeSprites();

  ball.bounceOff(topEdge);
  ball.bounceOff(bottomEdge);

  ball.bounceOff(playerPaddle);
  ball.bounceOff(computerPaddle);

  drawSprites();
}
```

	Do you observe any flaws in our game?	**ESR:** The computer paddle disappears if the ball goes off screen.



	Can you tell me how can we fix this? Teacher guides the student to write if statements so that the computer paddle moves back to the centre of the screen if the ball crosses the screen. *Explain "||" and "&&" to combine logic statements.*	***ESR:*** ***varied*** *The student writes code to move the computer paddle back on the screen if the ball crosses the screen.* *Student runs the code and checks the output.*

```
var playerPaddle = createSprite(380,190,10,70);
var computerPaddle = createSprite(10,190,10,70);
var ball = createSprite(200,200,10,10);

function draw() {
  background("white");

  playerPaddle.x = 380;
  playerPaddle.y = World.mouseY;

  computerPaddle.x = 10;
  computerPaddle.y = ball.y;

  if (keyDown("space")){
    ball.velocityX = 3;
    ball.velocityY = 4;
  }

  if (ball.x > 400 || ball.x < 0){
    computerPaddle.x = 10;
    computerPaddle.y = 190;
  }

  createEdgeSprites();

  ball.bounceOff(topEdge);
  ball.bounceOff(bottomEdge);

  ball.bounceOff(playerPaddle);
  ball.bounceOff(computerPaddle);
```

	As a challenge, why don't you work to sort this flaw out. We will also be solving this problem in our next class. Do you think you can take this challenge up?	**ESR:** Yes
Teacher Guides Student to Stop Screen Share		
Quiz time - Click on in-class quiz		
Question		**Answer**

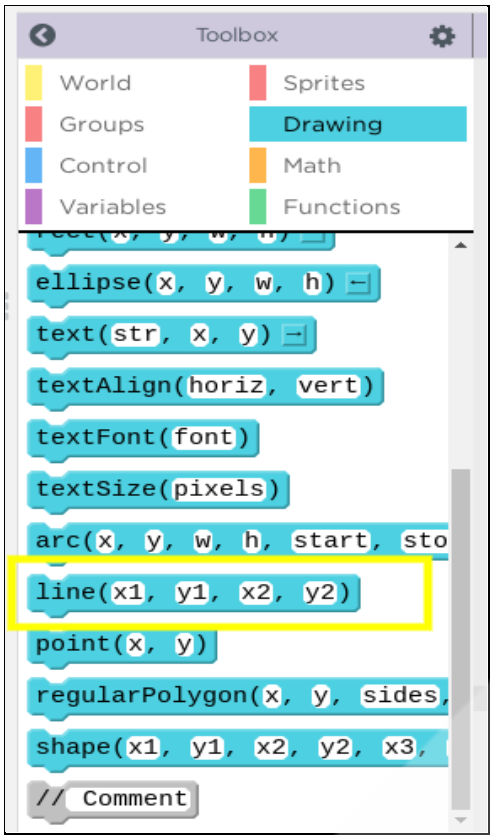
Consider the following code snippet for ball's movement in the Pong game:
 	
if (ball.isTouching(topEdge)) {
ball.shapeColor = "blue";
}
 	
Which of the option represents the correct output?
 	
A. Ball changes color to blue only on touching the top edge
B. Ball changes color to blue on touching top edges and continues to remain blue
C. Ball will change to blue color on touching top edge but on touching bottom edge it changes to default
D. Ball will stop after changing its color to blue
	A.

Identify the appropriate order of parameters (from left to right) in createSprite() function? A. (x,y,width,length); B. (x,y,length,breadth); C. (width,heigth,x,y); D. (x,y,width,height);	**D.**
What will happen if Sam misses using the drawSprites(); function inside function draw()? A. Repeated objects will be visible on the canvas B. No objects will be visible on the canvas C. No error, the game will run as usual D. The objects will appear but will not move on the canvas	**B.**
End the quiz panel	
WRAP UP SESSION - 5 Mins	

Teacher starts slideshow  from slide 18 to slide	
Activity details	**Solution/Guidelines**
Run the presentation from slide 18 to slide 26 **Following are the warm up session deliverables:** • **Explain the facts and trivias** • **Next class challenge** • **Project for the day** • **Additional Activity**	Guide the student to develop the project and share with us.
Teacher ends slideshow 	
FEEDBACK • **Complement the student for their efforts.** • **Review what the student did in the class.**	
Step 4: Wrap-Up (15 min)	So, we already have most of the Pong Game ready! There are a few more things left. Can you identify them? We will be doing these in the upcoming classes. We will also learn about something called Game State - it is something which programmers use to store game information while the game is on.
	The student compares the Full PONG game and the game he/she has just made. **ESR:** • Scoring system • The line at the centre • The text appearing on the screen • Sounds/animations

	Meanwhile, you can try to crack some of these game features on your own. Do you think you can do some of these on your own? Why don't you try and let's meet in our next class	**ESR:** Yes/Maybe
	You get Hats Off for your excellent work!	*Make sure you have given at least 2 Hats Off during the class for:* 
Project Name: **Return of the Jewel Thief**	**Goal of the Project:** In Class 4, you built the complete Pong game. You added the logic for movements of the player paddle, the computer paddle, and the ball. In this project, you will create a security system for a bank trying to protect a famous diamond from getting stolen. **Story:**	*Students engage with the teacher over the project.*

	Natwarlal is here to steal the famous Regent Diamond from the Bank of Jewels. You have been assigned the task to protect the diamond from getting stolen. Design a security system using two red laser beams to protect the diamond from Natwarlal. I am very excited to see your project solution and I know you will do really well. Bye Bye!	
Teacher Clicks 		
Additional Activities	"Remember, the original Pong Game had a dotted line at the centre?" "How do you think we can draw the line? Do you see anything in the drawing toolbox, which can help us draw the line?"	ESR: Yes ESR: line() instruction?



	Encourage the student to experiment with the numbers inside the line() to find out what they do.	*Student codes to experiment with the different values of* *x1,y1,x2,y2* *to get the expected output of a straight line.*

```
var playerPaddle = createSprite(380,200,10,70);
var computerPaddle = createSprite(10,200,10,70);



function draw() {
  //clear the screen
  background("white");

  //make the player paddle move with the mouse's y position
  playerPaddle.y = World.mouseY;

  //AI for the computer paddle
  //make it move with the ball's y position
  computerPaddle.y = ball.y;


  line(100, 0, 400, 400);

  //create edge boundaries
  //make the ball bounce with the top and the bottom edges
  createEdgeSprites();
  ball.bounceOff(topEdge);
  ball.bounceOff(bottomEdge);

  //make the ball bounce off the paddles
  ball.bounceOff(playerPaddle);
  ball.bounceOff(computerPaddle);

```

```
var playerPaddle = createSprite(380,200,10,70);
var computerPaddle = createSprite(10,200,10,70);



function draw() {
  //clear the screen
  background("white");

  //make the player paddle move with the mouse's y position
  playerPaddle.y = World.mouseY;

  //AI for the computer paddle
  //make it move with the ball's y position
  computerPaddle.y = ball.y;


  line(100, 100, 400, 400);

  //create edge boundaries
  //make the ball bounce with the top and the bottom edges
```

```
function draw() {
  //clear the screen
  background("white");

  //make the player paddle move with the mouse's y position
  playerPaddle.y = World.mouseY;

  //AI for the computer paddle
  //make it move with the ball's y position
  computerPaddle.y = ball.y;


  line(100, 100, 200, 400);

  //create edge boundaries
  //make the ball bounce with the top and the bottom edges
  createEdgeSprites();
  ball.bounceOff(topEdge);
  ball.bounceOff(bottomEdge);

  //make the ball bounce off the paddles
  ball.bounceOff(playerPaddle);
  ball.bounceOff(computerPaddle);

  //serve the ball when space is pressed
```

```
function draw() {
  //clear the screen
  background("white");

  //make the player paddle move with the mouse's y position
  playerPaddle.y = World.mouseY;

  //AI for the computer paddle
  //make it move with the ball's y position
  computerPaddle.y = ball.y;


  line(100, 100, 200, 200);

  //create edge boundaries
  //make the ball bounce with the top and the bottom edges
  createEdgeSprites();
  ball.bounceOff(topEdge);
  ball.bounceOff(bottomEdge);

  //make the ball bounce off the paddles
  ball.bounceOff(playerPaddle);
  ball.bounceOff(computerPaddle);

```

```
function draw() {
  //clear the screen
  background("white");

  //make the player paddle move with the mouse's y position
  playerPaddle.y = World.mouseY;

  //AI for the computer paddle
  //make it move with the ball's y position
  computerPaddle.y = ball.y;


  line(200, 0, 200, 400);

  //create edge boundaries
  //make the ball bounce with the top and the bottom edges
```

	Encourage the student to add colors and create a colorful Pong Game.	*The student adds colors to the Pong Game.*

	Encourage the student to write the code for the Pong game in the p5 editor. In p5 edges is created using : **edges = createEdgeSprites();** The topEdge, bottomEdge, leftEdge and rightEdge are stored inside arrays. Arrays are data structures which can store a number of items in a list. Edges array stores all the four edges in a list. These different edges can be accessed using their index from the edges array. edges[3] -> bottomEdge edges[2] -> topEdges and so on… PS: Solution link in the reference	*The student writes the code for the Pong Game in the p5 editor.*

Activity	Activity Name	Links
Teacher Activity 1	Pong Game [Full]]	https://studio.code.org/projects/gamelab/l8gg2lD9B0WlHEEJqGS0jzX3nZ6XMF7Nz6oNYaaqcy4
Student Activity 1	Pong Stage 2	https://studio.code.org/projects/gamelab/Ri2xig9d1D6kEkXHLXlabACUJ6B2IDOv6daCBQu_WcU/edit
Teacher Reference	P5 editor	https://editor.p5js.org/whitehatjr/sketches/hjROPFzD
Teacher Reference visual aid link	Visual aid link	https://s3-whjr-curriculum-uploads.whjr.online/ce835e18-e025-476d-bdcc-116ae16c652a.html
Teacher Reference In-class quiz	In-class quiz	https://curriculum.whitehatjr.com/Visual+Project+Asset/PRO_VD/Pro-C4_Deepali.docx.pdf

Project Solution	Return of the Jewel Thief	https://studio.code.org/projects/gamelab/YnvilzKhL-WDRYMLZMUuGVUP7bNDJgsnsg3OAzGCLZA