PLEASE NOTE

END YOUR CLASS WITH WOW FACTOR.

Amaze your student with a FUN WITH TECH

Find the Details in VA

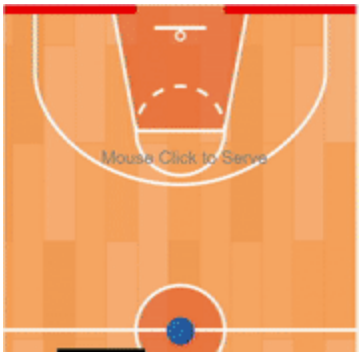
The 5 min activity can increase your chance of Student Renewal

Topic	**GAME COMPLEXITY & AUTOMATION**
Class Description	**Students will learn to introduce different types of complexity in the game as the score increases. Students will also learn how to automate the gameplay using AI.**
Class	**PRO-C7**
Class time	**50 mins**
Goal	• Learn about different logical operators in JavaScript. • Increase the velocity of the ball sprite as the score increases. • Make the bricks move downwards towards the paddle. • Assign AI to the paddle so that it can play the game on its own.

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** **Teacher - Led Activity** **Student - Led Activity** **WRAP-UP**	**10 mins** **15 mins** **15 mins** **10 mins**

• **WARM-UP SESSION - 10 mins**	
Teacher starts slideshow  **from slides 1 to 13** Refer to speaker notes and follow the instructions on each slide.	
Activity details	
How have you been? Are you excited to learn something new? **Run the presentation from slide 1 to slide 3.**	
QnA Session	
Question	
Select the block of code that would move the ball and set gameState to play when the player clicks on the mouse.	**A**



A.

```
function mousePressed() {
  ball.velocityX = 4;
  ball.velocityY = -3;
  gameState = "play";
}
```

B.

```
function mousePressed() {
  ball.velocityX = 0;
  ball.velocityY = 0;
  gameState = "play";
}
```

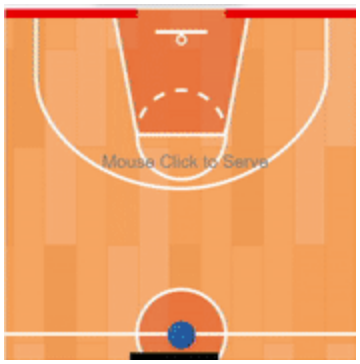
C.

```
function mousePressed() {
  ball.velocityX = 4;
  ball.velocityY = -3;
}
```

D.

```
function pressed() {
  ball.velocityX = 4;
  ball.velocityY = -3;
  gameState = "play";
}
```

Which of the following instructions is used to move the player paddle horizontally with the mouse?	**D**



A. player_paddle = mouseX;
B. player_paddle.move = World.mouseX;
C. player_paddle.y = World.mouseY;
D. player_paddle.x = World.mouseX;

Continue the WARM-UP session

Activity details	**Solution/Guidelines**
Run the presentation from slide 4 to slide 11 to set the problem statement. **Following are the WARM-UP session deliverables:** ● About logical operators. ● Assign artificial intelligence to the paddle.	Narrate the story by using hand gestures and voice modulation methods to bring in more interest in students.

Teacher ends slideshow

TEACHER-LED ACTIVITY 1 (10 - 15 mins)

Teacher Initiates Screen Share

CHALLENGE

- **Implement Logical Operators for different use cases.**
- **Increment the velocity of the ball sprite on each hit with the brick.**

Teacher-led Activity (20 mins)	

Teacher Action	Student Action
Hi <student_name>, how are you doing? In the last class we completed the breakout game. Did you play it after the class? Great! Today we will introduce some complexities to the game and also assign Artificial Intelligence to the paddle so that it can play the game on its own. Exciting?	ESR: Varied. ESR: Yes/No. ESR: Yes
But before we introduce AI, let's learn about logical operators first. Do you remember in the last class, we checked if the sprite group 'bricks' is empty or not? How did we do it? Correct! We had used a '!'(not) operator for the same: << if(!bricks[0]) >> ! is a logical not operator. It returns true if the operand is false and vice versa. For eg. !false = true & !true = false. That's why !bricks[0] will be true when bricks[0] is false or empty.	ESR: Yes. ESR: We checked if the brick group is not empty.
LOGICAL NOT OPERATOR 	
Today we will learn few more logical operators such as:	

1) && operator which returns true only if both the operands are true else it returns false.
As the name suggests 'and' that means both operands should be true.

For e.g. I need cake and a toy which means I need both.

2) || operator which returns false only if both the operands are false, otherwise it returns true if either of the operands is true.

For e.g. I need a cake or a car. Here I will be happy if I get any one of them or both. I will be sad only if I get neither of them.

LOGICAL AND

Operand 1	Operand 2	AND (&&)
TRUE	TRUE	TRUE
TRUE	FALSE	FALSE
FALSE	TRUE	FALSE
FALSE	FALSE	FALSE

LOGICAL OR

Operand 1	Operand 2	OR (||)
TRUE	TRUE	TRUE
TRUE	FALSE	TRUE
FALSE	TRUE	TRUE
FALSE	FALSE	FALSE

Where can we use these operators? They are generally used in the if statements to write complex conditions. For e.g to check the leap year we need to see if the month is 'Feb' and No of days are '29' then it's a leap year. Today we will write a few programs to practice these logical operators but before that I want to introduce you to one of the important mathematical operators used in programming i.e. '**modulo**' operator represented by percentage symbol.(**%**) The mod **' % '** operator returns the remainder when number **1** is divided by number **2**. E.g. when **5** is divided by **2**, the remainder will be **1**. Can you tell me where I will find it on the Toolbox? Can you find the **%** symbol on your keyboard? . Let's say if we have to write a program to check if the number is divisible by 2 and also the number should be greater than 60. What will be the conditions and logical operator for this problem statement? *The teacher clicks on the Teacher Activity 1 link and clicks on remix. Teacher writes the code to define a new function called '**check()**' for the above mentioned problem statement.*	ESR: Varied. **ESR: Maths** tab. **ESR:** On the number **5** (***Shift + 5***) ESR: Condition for divisible by 2: **x%2==0**. Condition for numbers greater than 60: **x>60**. Operator: AND

Great! Our program is working fine. Only input '62' satisfies both conditions. '32' fails the 2nd condition and is less than 60 whereas '65' fails at the first condition and is not divisible by 2. Let's try one more? Would you help me? Write a program to check if the number is divisible by 2 or it is less than 30. What will be the two conditions and the logical operator in this case? *Teacher edits the '**check()**' function for this problem statement and changes the input to 15, 32 and 65. Teacher runs the code.*	**ESR:** Yes **ESR:** Condition1: x%2==0; Condition 2: x<30; Operator: OR

Great now that you know logical operators, let's go back to the game. Today we will try to increase the complexity of the game. What can we do to increase the complexity of the game? Can we increase the speed of the ball as the bricks are destroyed? How can we increase the speed of the ball? *Teacher clicks on Teacher Activity 2 link and clicks on remix.*	 ESR: Varied. ESR: Yes. ESR: increasing the velocity of the ball.

Teacher writes the code to increase the speed of the ball on every brick hit.	

```
function brickHit(ball, brick) {
 playSound("sound://category_hits/puzzle_game_button_04.mp3")
 brick.remove();
 score = score+5;

 ball.velocityX *= 1.05;
 ball.velocityY *= 1.05;

}
```

Did you notice if the speed of the ball sprite becomes too fast, the game doesn't work properly especially the bounceOff() function. So we need to decide the maximum velocity of the ball in both directions. As per my experience, a velocity of 12 would be good enough for the complexity. *Note: Higher Velocity value (greater than 12) can create some issues in the game. If needed, let the student try running the game at speed of 12 to ensure there is no issue.* Can you tell me the condition to check if velocityY is less than 12 then only we should increase the velocity of the ball otherwise we will not increase the velocity further.	**ESR:** Yes **ESR:** (ball.velocityY < 12)

```
function brickHit(ball, brick) {
 playSound("sound://category_hits/puzzle_game_button_04.mp3")
 brick.remove();
 score = score+5;

 if(ball.velocityY<12)
  { ball.velocityX *= 1.05;
    ball.velocityY *= 1.05;

  }
}
```

Did you notice, speed is not increasing in case of going down but velocity keeps increasing in the upward direction?

ESR: Yes

Because we did not limit the negative values of velocityY.

We need to write one more condition to check that velocityY should not go below -12 as well.

Can you tell me which logical operator should be used between two conditions?

ESR: &&

Teacher helps the child write the condition to check if velocity is > -12 and velocity < 12 then only increase the velocity.

```
function brickHit(ball, brick) {
 playSound("sound://category_hits/puzzle_game_button_04.mp3")
 brick.remove();
 score = score+5;

 if(ball.velocityY >-12 && ball.velocityY<12)
  { ball.velocityX *= 1.05;
    ball.velocityY *= 1.05;

  }
}
```

Great! We have increased the complexity of the game as score increases. Now it's your turn. Please share your screen with me.	
Teacher Stops Screen Share	
STUDENT-LED ACTIVITY 1 - 20 mins	
• **Ask Student to press ESC key to come back to panel** • **Guide Student to start Screen Share** • **Teacher gets into Fullscreen**	
CHALLENGE • **The student makes the bricks move downwards.** • **The student adds AI to the paddle to move automatically.**	
Teacher starts slideshow  **for slide 14 to 17** Refer to speaker notes and follow the instructions on each slide.	
Guide the student to open his own game updated code or click on Student Activity 1 Link and click on remix. Can you tell me any more ways to increase the complexity of the ball? Do you want to try to make the bricks move downwards? Let's try it. Your turn now. Since bricks are a group sprite. Can you look into the group tab list of methods and search for something to give velocityY to the group? *Teacher helps the child write a code to assign velocity to the bricks group. Also explain bricks should start moving*	**ESR:** Varied. **ESR:** Yes. **ESR:** setVelocityYEach()

only after the game is in play state. i.e. once the mouse is clicked to start the ball and game.	

```
function mousePressed()
{
  if(gamestate == "start")
  {
    gamestate = "play";
    ball.velocityY = -7;
    ball.velocityX= 7;

    bricks.setVelocityYEach(0.2);


  }

}
```

That was great!

Note for Teacher: Since we have added too much speed to the ball and now that bricks have also started moving. The speed of the ball will increase significantly on bouncing from the bricks and if you further increase the velocity of bricks to 0.3 or more, the ball might stick to the paddle so restrict the velocity of bricks to 0.2 for smoother game.

Now it is time to assign AI to our Paddle!

Let's do that.

Can you tell me if the computer has to move the paddle, what should the computer be referring to?

ESR: 'x' position of the ball.

Correct! The paddle should follow the x-position of the ball to beat the player and hit the ball.

Teacher helps the child code to add automation to the game.	

```
function gameplay()
{
  //paddle.x = World.mouseX;
  paddle.x = ball.x; //automate
  if(paddle.x < 60)
  {
    paddle.x = 60;
  }

  if(paddle.x > 340)
  {
    paddle.x = 340;
  }
  drawSprites();
```

Superb! Did you observe that now the computer can play the game on its own. Though Computers have zero IQ of their own but with some intelligence provided by the programmers/coders, they can do wonders. How do you feel?	**ESR:** Varied.

Teacher Guides Student to Stop Screen Share

- **WRAP-UP SESSION - 10 mins**

FEEDBACK

- **Appreciate and compliment the student for trying to learn a difficult concept.**
- **Get to know how they are feeling after the session.**
- **Review and check their understanding.**

Teacher starts slideshow  **for slide 18 to 29**

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

Activity details	Solution/Guidelines
Run the presentation from slide 18 to slide 29. **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.*
QnA Session	
Question	**Answer**
Which operator returns true if the operand is false and vice versa? A. OR B. AND C. NOT D. NO	**C**

What does the highlighted code in the following snippet do?
 	
`function brickHit(ball, brick) {`
`playSound("sound://category_hits/puzzle_game_button_04.mp3")`
`brick.remove();`
`score = score+5;`
`ball.velocityX *= 1.05;`
`ball.velocityY *= 1.05;`
`}`
 	
A. increase the speed of the bricks
B. destroy the brick
C. play sound
D. increase the speed of the ball
	D

Which of the following commands help us in automating the paddle? A. paddle.x= ball.x B. ball.x = paddle.x C. paddle.y = ball.y D. paddle.velocityX = 5	A
End the quiz panel	
FUN WITH TECH FOR STUDENT TO PERFORM (MUST)	
• **Ask the student to press ESC key to come back to the panel** • **Guide the student to start Screen Share** • **The teacher gets into full screen**	
Today you have built your very first game with AI. It is now time to open the FUN WITH TECH.	
The teacher shares a link from Student Activity 2 over a chat. Do you know how an astrophysicist (the one who studies stars and other objects in space using physical laws) spends hours in front of the telescope staring at the sky? You can achieve that easily using the Stellar App. *The teacher can share the following instructions about how to play this.* 1. The Home screen contains 3 different buttons. StarMapScreen, DailyPicScreen, and Spacecraft screen. 2. Click the buttons to navigate to the respective screens. 3. On the StarMapsScreen you'll need to enter your	ESR: Varied.

longitude and latitude to see the stars around your area. 4. In the DailyPicScreen you'll see the different pictures or articles related to space activities published by NASA. 5. In the SpaceCraftScreen you'll be able to see the different types of space crafts created for data and read the information on them. *While the student is playing the game Teacher can mention:* This app is created using the React Native platform. Using this platform you can create native mobile applications for Android, iPhone or other platforms. Facebook, Instagram, Pinterest are some examples of the applications created using React Native. In recent times, all the businesses are moving towards Mobile App such as food delivery, ticket booking, e-commerce. You too can identify the problems around us which can be resolved using technology and build an app to solve the same. For now, you can stop sharing the screen and let's move ahead. *For teacher reference: this app will be created in class 76-80.*	
You get Hats Off for your excellent work!	*Make sure you have given at least 2 Hats Off during the class for:* 

Awesome! Next class is a capstone class.You have been learning new concepts every class. It is now time to slow down a bit and revise every concept we have covered in past 7 classes. You will be creating a complete new game all by yourself in the Capstone class. Are you excited?	  ESR:Yes
Project Overview **SMART PING PONG** **Goal of the Project:** By Class 7, you have learned how to increase the game's complexity and apply intelligence in the game to play it automatically. In this project, you will have to practice and apply what you have learned so far and enable a smart computer player in the game as an opponent. **Story:** Dodo loves to play the Pong game and has mastered the game. He likes to be challenged at the Pong game and hence decides to change the game and make it a bit more challenging. Also Dodo wants to enable AI in the computer paddle movement so that he always has a strong opponent. Can you help Dodo enable AI & level up the complexities in the Pong game?	*The students engage with the teacher over the project.*

I am very excited to see your project solution and I know you will do really well. Bye Bye!	
Teacher ends slideshow 	
Teacher Clicks ✖ End Class	

Activity	Activity Name	Links
Teacher Activity 1	Blank Activity	https://studio.code.org/projects/gamelab/iWDGbYGXZygwx-pjER4kAis2Iljm88rBy9BXCbYp07Q
Teacher Activity 1.1 Ref code	AND Operator	https://studio.code.org/projects/gamelab/bimtRFt3f8sGoordhLyZr74z5IOYVZQafRoMFLYhgF0
Teacher Activity 1.2 Ref code	OR Operator	https://studio.code.org/projects/gamelab/bimtRFt3f8sGoordhLyZr1WJikduy0poEggVE3g_rmc
Teacher Activity 2	Breakout Game 1.6	https://studio.code.org/projects/gamelab/us0cmEbjjTsHGgkI7OBK4Wz_d4iLYue4xmGL94wV8cM
Teacher Activity 2 Ref code	Complexity Increment	https://studio.code.org/projects/gamelab/2S61QRAOA19EI4dfnCia27aBg-ZdCGo49PJofaGOHZI
Student Activity 1	AI in Breakout	https://studio.code.org/projects/gamelab/2S61QRAOA19EI4dfnCia27aBg-ZdCGo49PJofaGOHZI
Teacher Ref Code (Breakout 1.7)	Breakout Game 1.7	https://studio.code.org/projects/gamelab/H1j5--0K0DIILCA3tSckfr2zfWjqDcsb4bY2jQN73FM
Teacher Reference visual	Visual aid link	https://curriculum.whitehatjr.com/Visual+Project+Asset/PRO_Fun+with+tech/BJFC-PRO-V3-C7-w

aid link		ithcues.html
Teacher Reference In-class quiz	In-class quiz	https://s3-whjr-curriculum-uploads.whjr.online/1e09606d-e35f-4e13-8191-2050c3e48970.pdf
Teacher Activity 4	FUN WITH TECH	https://snack.expo.dev/@git/github.com/pro-whitehatjr/Stellar-Stage-5
Student Activity 2	FUN WITH TECH	https://snack.expo.dev/@git/github.com/pro-whitehatjr/Stellar-Stage-5