### Install AgentCubes

1. Go to [http://code.org/api/hour/begin/agentcubes](http://code.org/api/hour/begin/agentcubes) from your web browser (Google Chrome is recommended) to access AgentCubes.

### Using Video with Instructions - Optional

- **Optional:** When you access AgentCubes from the link above a video will appear that you can watch along with these instructions. Click the pause button and the hide video link to go directly to AgentCubes after each step and then click show video to have the video reappear.

### AgentCubes Layout

- **Agent Lists:** On the left of the screen contains your agents (*i.e.* Frog).
- **Grid:** The blue grid is where you will create your 3D world.
- **Behavior Editor:** Where you will create the programming rules that will guide your agent’s behavior.
- **Conditions and Actions Panels:** The conditions and actions will allow you to create rules in the Behavior Editor for your agents.

### Create World

2. Click the **+ button** to the right of World: from the top toolbar to add your world. **Name** your world **Frogger** and click **OK**. Leave everything else as it is.

![New World dialog box](image)

### Add Frog Agent

3. Click the **Agent** button on the lower left of the **Agent Lists** screen.
4. From the **New Agent Shape Browser** window, select the **Inflatable Icon** from the first column. Leave the 2\(^{nd}\) and 3\(^{rd}\) column as they are.
5. To make your own **Frog**, leave the ladybug (**Akako**) selected and name your agent **Frog** to the right of Name: on window.

![Agent Shape Browser](image)
6. Click OK on the lower right of screen. Now you will see the image under the **Agents List**. Remember you will change the image to a **Frog** in the next step.

### Creating Frog Agent

7. Double-click the **Agent’s icon** (not on the name but the actual image of the ladybug) to open the illustration of your image. The **Inflatable Icon Editor** appears:

![Inflatable Icon Editor](image.png)

**Note:** If you don’t see all the tools (*clear, flatten*) in the window above click the **More tools…**button.

8. Click the **Clear** button in the middle of your screen to remove the ladybug.
9. On the left side of the screen is the 2D editor, from the toolbar on the left click the **Mirror Vertically tool**. This will add a blue line in the center of the screen.

**Note:** Anything you draw on the left side of the blue line will be mirrored on the right side of the line.

10. Select the **pencil tool** from the left side toolbar and click the **color box** to **select the color green**. The color box will turn green.
11. Using the **pencil tool**, draw the left side of the Frog and it will be duplicated on the right side. As you draw on the 2D platform you will see the 3D version on the right of the screen. Make sure to add some eyes to the **Frog**.

**Note:** To step back a step **press Ctrl+Z**, use the **bucket to fill in**, use the **eraser tool to erase**. To change a color remember to go back to the **color box**.
12. When finished creating the Frog, **click the + symbol** located in the center of the screen a number of times to inflate the Frog. Watch the 3D platform on the right side to see the Frog inflate.

13. To inflate the Frogs’ legs even more, select the **Magic Wand** from the toolbar on the left side of the 2D platform. Next, click on the left leg to select it. Then hold down the **Shift key on your keyboard** and click the right leg. You should have both legs selected (see illustration below).

![Frog inflated](image)

14. With both legs selected, **click the + button** in the center of the screen to inflate the legs. Watch the 3D platform on the right side to see the legs inflate.

15. To deselect the Frog’s legs, **press Ctrl+D** on your keyboard.

16. To view the Frog in 3D, select the **Rotate Camera** tool from the toolbar on the right side of the screen. Click the preview area (**the space where the Frog is located**) and drag to rotate the Frog.

![Rotate Camera](image)

17. Click **Save** to save your work and the **Inflatable Icon Editor** closes.

<table>
<thead>
<tr>
<th>Building World: Frog Movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Select the <strong>Frog</strong> in the <strong>Agents List</strong> on the left side of the screen.</td>
</tr>
<tr>
<td>19. From the top toolbar, select the <strong>pencil tool</strong>.</td>
</tr>
<tr>
<td>20. Click in the grid where you would like the <strong>Frog</strong> to be located. The <strong>Frog</strong> should be placed in the center of the bottom row of the grid.</td>
</tr>
<tr>
<td>21. It is a good practice to save your work, click the <strong>Save</strong> button from the top toolbar.</td>
</tr>
</tbody>
</table>
22. To verify you have the Frog behavior selected, you should see Behavior: Frog indicated on the top of the Behavior Editor window located in the center of the screen.

23. The Frog is now on the grid, to have the Frog move you will need to program behaviors. Click the arrow button from the top toolbar and then select the Conditions Panel on the left side of the screen.

24. From the Conditions Panel, scroll down to select the key condition under the title keyboard and drag to the if section of the rule in the Behavior Editor window. Make sure the key condition has the up arrow value selected.

25. Next, go to the Actions panel and select the Move Action at the top of the panel. Drag the Move Action to the then section of the rule.

26. Click the Move Action under the then section of the rule and select the up arrow as the value of this action. This will tell the Frog to move up in the world.

27. To check that the Frog will move up, click the Run button from the top toolbar and press the up arrow to see the Frog move up in the world.

28. Next, create 3 more movements on your own, the left, right, and down movements. Click the red Stop button from the top toolbar and click the Refresh/Reload button on the toolbar to reset the Frog in its original position at the bottom center of the world.

29. Click a blank area of the current Rule in the Behavior Editor window and click the Duplicate button at the bottom of the screen to duplicate the rule 3 times.

Note: You can also create new rules by selecting the Rule button at the bottom of the screen. Make sure they are separate rules (see illustration below).

30. Edit the 3 rules to include the last 3 movements of left, right, and down. When finished it should look like this:

31. To test the Frog’s movement in your world, click the Run button from the top toolbar and use your arrow keys on the keyboard to move the Frog.

32. Click the Stop button from the top toolbar and the Refresh/Reload button to get the Frog back to where it started.
### Create Grotto
33. Create a new **Agent** by clicking the **Agent** button on the lower left of window.  
34. Select **Cube, Brick** and **Ancient Mayan Blocks**.  
35. Name the **Agent Grotto** and click **Save**.  
36. The **Grotto** should show in the **Agent List**.

### Add the Grotto to World
37. Make sure the **Grotto** is selected in the **Agent List**.  
38. Select the **pencil tool** from the top toolbar and click in the top center row of your grid to add the **Grotto**.

### Add Rule for Frog reaching Grotto
39. Make sure the **Frog** is selected in the **Agent List**.  
40. In the **Behavior Editor** window select the first rule.  
41. Next, click the **+Rule** button at the bottom. That creates a new rule under the selected rule.  
42. Then, select the new rule and drag it above all the other rules. It should be the first rule in the **Behavior Editor** window.  
43. For the new rule, drag **Stacked Immediately above the Grotto** *(make sure to select Grotto)* from the **Conditions panel** on the left to the **If column** in the rule.  
44. On the right **Actions panel**, drag **play-sound** under the **Then column** in the rule. Select the **trara.mp3** as your sound by using the drop down  
45. Again, from the **Actions panel**, drag the **show-message** under the **Then column**. Type in the message “You win”.  
46. From the **Actions panel**, drag **reload-world** under the **Then column**, so the game resets itself when it is finished.

### Run Game using the First Person View
47. Select the **Arrow tool** from the top toolbar and select the **Frog** in the World.  
48. Click the **Camera tool** from the top toolbar to switch to the first person view.  
49. Select the **Rotate Camera tool** from the top toolbar to rotate the **Frog** forward toward the **Grotto**.  
50. Click the **Run button** to run your game. Click the up arrow on your keyboard to move the **Frog** forward. When the **Frog** reaches the **Grotto**, you should see the message “You Win”.  
51. Click the **OK** at the message window “**You Win**” and select the **Stop button** from the top toolbar.  

**Note:** Use the **Hand tool** to move the **World** and the **Zoom tool** to zoom in the **World**.
Take a break at any time by clicking **Submit the Game** on top right and return later to finish.

| Create Road Agent | 57. Click the **Agent** button on the lower left of the **Agent Lists** screen.  
| | 58. From the **New Agent Shape Browser** window, select the **Inflatable Icon** from the first column. Leave the 2\(^{nd}\) and 3\(^{rd}\) column as they are.  
| | 59. To make your Road, name your **Agent Road** to the right of **Name:** on window.  
| | 60. Click **OK** on the lower right of screen. Now you will see the image under the **Agents List**. Remember you will change the image to a **Road** in the next step.  
| | 61. Double-click the **Agent’s icon** (*not on the name but the actual image*) to open the illustration of your image in the **Inflatable Icon Editor**.  
| | **Note:** If you don’t see all the tools (*clear, flatten*) in the window click the **More tools...button**.  
| | 62. Click the **Clear** button in the middle of your screen to remove the image.  
| | 63. On the left side of the screen is the 2D editor, from the toolbar on the left click the **Mirror Horizontally and Vertically tool**. This will add a blue cross on the screen.  
| | 64. Select a **Dark Gray** color from the **color box** and click **OK**.  
| | 65. Click the **Paint Bucket** from the toolbar and click inside one of the squares to make them all **Dark Gray**.  
| | 66. To make the lines for the **Road**, select the **Yellow color** from the **color box** and click **Ok**.  
| | 67. Select the **Pencil tool** from the toolbar and start in the center and drag toward the left edge. This will be mirrored in all four parts of the window.  
| | 68. Next, to draw the center lines, select a **Light Gary** from the **color box** and click **OK**.  
| | 69. Select the **Pencil tool** from the toolbar and starting in the center drag a couple of dash links toward the left edge. This will be mirrored on the right side.  
| | 70. Click the **Save** button from the top toolbar.  
| Add 3 Lane Roadway to World | 71. Make sure the **Road** is selected in the **Agent List**.  
| | 72. Select the **Multiple Agent Insert tool** from the top toolbar.  
| | 73. Then, select the row that is above the **Frog** from the left side, up to the right side as illustrated.  
| Create Truck Agent and Add to Roadway | 74. Create a new **Agent**, select the **Inflatable Icon** option in column 1, select the **Vehicle** option in column 2 and select a **Truck** in column 3.  
| | 75. **Name** your **Agent Truck** and click **Save**.  
| | 76. Make sure the **Truck Agent** is selected and click the **Pencil tool** from the toolbar.  
| | 77. Add multiple **Trucks** to the highway in a random pattern as illustrated.  

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*Developed by Carla Hester Croff, Western Wyoming Community College*
78. Click the **Save** button from the top toolbar to save your work.

<table>
<thead>
<tr>
<th>Create Truck Behavior that moves the Truck to the Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>79. With the <strong>Arrow tool</strong> from the top toolbar, select one of the <strong>Trucks</strong> in the <strong>World</strong>.</td>
</tr>
<tr>
<td>80. From the <strong>Truck Behavior Editor window</strong>, select the <strong>See Condition</strong> from the <strong>Conditions</strong> window and drag it to the <strong>If column</strong> of the window. Set the <strong>See Condition</strong> to <strong>If it Sees a Road</strong> to the right.</td>
</tr>
<tr>
<td>81. Next, select the <strong>Once Every Condition</strong> and drag it to the <strong>If column</strong> of the window. Set the <strong>Once Every Condition to 0.5 seconds</strong>.</td>
</tr>
<tr>
<td>82. Then, from the <strong>Actions window</strong> drag the <strong>Move Actions</strong> to the <strong>Then column</strong> and select the right arrow (see illustration below).</td>
</tr>
</tbody>
</table>

83. Test your game by selecting the **Run** button from the top toolbar.  
**Note:** The **Trucks** will all move to the right and pile up to the right.

<table>
<thead>
<tr>
<th>Create Dead Frog Behavior for when the Truck hits the Frog</th>
</tr>
</thead>
<tbody>
<tr>
<td>84. Click the <strong>Reload/Refresh</strong> button from the top toolbar to reset your <strong>World</strong>.</td>
</tr>
<tr>
<td>85. With the <strong>Arrow tool</strong>, select the <strong>Frog Agent</strong> from the <strong>Agent Lists</strong>.</td>
</tr>
<tr>
<td>86. Go to the <strong>Behavior Editor window</strong>, select the top rule and click the <strong>+Rule button</strong>. This should add a rule below the top rule and above the arrow rules (see illustration below).</td>
</tr>
<tr>
<td>87. Program <strong>If I See to the left a Truck, Then I will play-sound klink.mp3, stop-simulation</strong> and show message “Oh No! Game Over”.</td>
</tr>
</tbody>
</table>

88. To test make sure you **Reload/Refresh** the **World**, then click the **Run button** and use the up arrow to move the **Frog** into the path of a **Truck**. There is a collision and the game is over.  
89. You should see the message “Oh No! Game Over”, click **OK** to dismiss the message.
### Create Tunnel Agent

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.</td>
<td>First you will want to remove the Trucks from the World by selecting the Eraser tool from the top toolbar and selecting each of the Trucks on the World.</td>
</tr>
<tr>
<td>91.</td>
<td>Create a new Tunnel Agent and select Inflatable Icon from column 1 and leave column 2 and 3 as they are. Name the Agent Tunnel.</td>
</tr>
<tr>
<td>92.</td>
<td>Double-click the Tunnel image from the Agents List and click Clear to clear the current image. Make sure the Horizontally and Vertically Mirrored tool is selected.</td>
</tr>
<tr>
<td>93.</td>
<td>Select a Dark Brown from the color box and with the Paint Bucket tool click any square to make them all Dark Brown.</td>
</tr>
<tr>
<td>94.</td>
<td>Go back to the color box and select a Black color.</td>
</tr>
<tr>
<td>95.</td>
<td>Select the Pencil tool to draw an Arch and use the Paint Bucket tool to fill one of the Arches and it will fill them both.</td>
</tr>
<tr>
<td>96.</td>
<td>Next, inflate the tunnel by clicking the + symbol a few times. You will see the inflation on the 3D window.</td>
</tr>
<tr>
<td>97.</td>
<td>To make an entrance and exit for the Tunnels, select the Magic Ward tool and select the two Arches by clicking one of the Arches and Shift click the other.</td>
</tr>
<tr>
<td>98.</td>
<td>Press Delete or Backspace on your keyboard to delete the Arches.</td>
</tr>
<tr>
<td>99.</td>
<td>Select the entire Tunnel by click Ctrl+A.</td>
</tr>
<tr>
<td>100.</td>
<td>Add some Noise to the image by moving the Noise slider to the right a little.</td>
</tr>
<tr>
<td>101.</td>
<td>You may want to deflate by click the – symbol.</td>
</tr>
<tr>
<td>102.</td>
<td>With the Camera Rotate tool selected from the 3D window toolbar, click and drag for a preview of the 3D Tunnel.</td>
</tr>
<tr>
<td>103.</td>
<td>Click Save to save the Tunnel Agent.</td>
</tr>
</tbody>
</table>

### Add Tunnels to the Highway

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>104.</td>
<td>With the Pencil tool add 3 Tunnels on the left and right side of the Highway.</td>
</tr>
<tr>
<td>105.</td>
<td>Save the World with your changes.</td>
</tr>
</tbody>
</table>
3D Frogger Lesson using AgentCubes

Create Tunnel Behaviors to Generate Trucks from the Left Side and Absorb Trucks on the Right Side

106. Using the **Pencil tool**, select one of the **Tunnels** in the World.
107. From the **Tunnel Behavior Editor** window, program the left Tunnel rule *(if it sees a Road to the right, once every 0.5 second create a new Truck)*:

![Tunnel Behavior Editor](image)

108. Next, with the **Arrow tool** select one of the **Trucks** in the World.
109. From the **Truck Behavior Editor** window, select the current rule and click the **+Rule** button to add a new rule.
110. Add **If I See a Tunnel to the Right, Then I will Erase myself** *(refer to second rule below)*.

![Truck Behavior Editor](image)

111. Click the **Run button** to test the game.
112. Select a **Tunnel** from the **World** and add a **percent chance to 20** to the **Tunnel Behavior** and run the game.

![Tunnel Behavior](image)

113. Wait to see an interesting traffic pattern and then click **Save** to save these changes to the **World**.
114. **Run** the game to play. Click **OK** when game is over and the game resets.

Run the Game in First Person View

115. With the **Arrow tool**, select the **Frog**.
116. Click the **Camera tool** from the top toolbar to switch to **First Person View**.
117. Use the **Up Arrow** to move the **Frog** in the path of a **Truck**. This of course ends the game.

**Note:** Now you have learned 3 computational thinking patterns, collision *(the collision of **Truck** and **Frog)*, generation *(the **Tunnels** creating **Trucks)* and absorption *(the **Tunnel** absorbing **Trucks)*.

Take a break at any time by clicking **Submit the Game** on top right and return later to finish.
| Create River Agent | 118. Create a **River Agent**, select **Inflatable Icon** from column 1, select **Landscape** from column 2 and select **Aqua** from column 3. **Name Agent River** and **Save**.  
119. Using the **Multiple Agent Insert tool**, add two rows of the **River** (see illustration below): |
| --- | --- |
| Add Drowning to Frog Behavior | 120. As the **Frog** crosses the **River** he can drown, use the **Arrow tool** to select the **Frog** in the **World**.  
121. Drag the Frog just beneath the River as shown in this illustration:  
122. Select the top rule in the **Frog Behavior Editor** window and add a new rule.  
123. Create the following rule (*If the Frog is stacked immediately above the water play-sound, show-message “I CANNOT SWIM” and reload-world*):  
124. To test this rule, click the **Run button** and use the **Up Arrow** to move the **Frog** onto the water.  
125. The message “**I CANNOT SWIM**” appears and click **OK** to restart game. **Click the Stop button**, if necessary. |
| Create Log Agent | 126. Create a **Inflatable Log Agent**.  
127. When drawing the **Log**, select the **Horizontally and Vertically Mirrored tool** and select the **Dark Brown** color in the color box.  
128. Use the **Pencil tool** to draw a line straight across and use the **Paint Bucket tool** to fill it with **Dark Brown**.  
129. Select an **Orange** color from the color box and with the **Pencil tool** draw an **Arch**.  
130. Use the **+ symbol** to **Inflate** the **Log** quite a bit. |
### 3D Frogger Lesson using AgentCubes

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>131.</td>
<td>Select the <strong>Magic Ward tool</strong> and select the <strong>Brown</strong> area.</td>
</tr>
<tr>
<td>132.</td>
<td>With the <strong>Camera Rotate tool</strong> on the 3D window, drag and view the <strong>Log</strong> from the side. This will give you a better idea on how much to deflat it with the – symbol.</td>
</tr>
<tr>
<td>133.</td>
<td>Add a little bit of <strong>Noise</strong> by sliding the <strong>Noise slider</strong>. Click <strong>Save</strong>.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>Just like the <strong>Tunnel</strong> generates <strong>Trucks</strong>, next you’ll create a <strong>Bridge Agent</strong> that will generate <strong>Logs</strong>.</td>
</tr>
</tbody>
</table>

#### Create Bridge Agent

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>134.</td>
<td>Create an <strong>Inflatable Icon</strong> for the <strong>Bridge Agent</strong>.</td>
</tr>
<tr>
<td>135.</td>
<td>Double-click the <strong>Agent</strong> from the <strong>Agent Lists</strong>, click <strong>Clear</strong> and use the <strong>Horizontally and Vertically Mirrored tool</strong>.</td>
</tr>
<tr>
<td>136.</td>
<td>Select <strong>Gray</strong> color from the color box and click <strong>OK</strong>.</td>
</tr>
<tr>
<td>137.</td>
<td>With the <strong>Paint Bucket tool</strong>, fill the image.</td>
</tr>
<tr>
<td>138.</td>
<td>Select <strong>Black</strong> color from the color box and click <strong>OK</strong>.</td>
</tr>
<tr>
<td>139.</td>
<td>With the <strong>Pencil tool</strong> draw an <strong>Arch</strong> and fill the <strong>Arches</strong> with <strong>Black</strong>.</td>
</tr>
<tr>
<td>140.</td>
<td>Press the + symbol to over inflate the icon.</td>
</tr>
<tr>
<td>141.</td>
<td>With the <strong>Rectangle Section tool</strong> on the 2D window, draw a vertical section in the center.</td>
</tr>
<tr>
<td>142.</td>
<td>To get an indent in the top of the <strong>Bridge</strong>, select the <strong>Ceiling slider</strong> to push the selected part (vertical section in the step above) down.</td>
</tr>
<tr>
<td>143.</td>
<td>With the <strong>Magic Ward tool</strong>, select the left <strong>Black Arch</strong> on the 2D window and then Shift click the right <strong>Arch</strong>.</td>
</tr>
<tr>
<td>144.</td>
<td>Press <strong>Delete</strong> or <strong>Backspace</strong> to create openings for the <strong>Bridge</strong>.</td>
</tr>
<tr>
<td>145.</td>
<td>Press <strong>Ctrl+D</strong> to deselect.</td>
</tr>
<tr>
<td>146.</td>
<td>Use the <strong>Camera Rotate tool</strong> to see how the <strong>Bridge</strong> looks.</td>
</tr>
<tr>
<td>147.</td>
<td>Click <strong>Save</strong> to save the <strong>Bridge</strong>.</td>
</tr>
</tbody>
</table>

#### Add Bridges to World

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>148.</td>
<td>Use the <strong>Pencil tool</strong> to add a couple of <strong>Bridges</strong> to the <strong>World</strong>.</td>
</tr>
<tr>
<td>149.</td>
<td><strong>Save</strong> the <strong>World</strong> with these changes.</td>
</tr>
</tbody>
</table>

#### Add Left Bridge Behavior to Generate Logs

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>150.</td>
<td>Using the <strong>Arrow tool</strong>, select a <strong>Bridge</strong> from the <strong>World</strong>.</td>
</tr>
<tr>
<td>151.</td>
<td>In the <strong>Bridge Behavior Editor</strong> window, create the following rule (<em>If the <strong>Bridge</strong> sees water to the right, once every 0.5 seconds with 20 percent chance then create a new <strong>Log</strong></em>):</td>
</tr>
</tbody>
</table>
### Add Log Behaviors to Move Logs to the Right, Right Bridge to Absorb Logs and Logs to Transport the Frog

152. Select the Log Agent. In the Log Behavior Editor window, create the following rules *(If the Log sees water to the right once every 0.5 seconds then move and transport to the right and 2nd rule is if the Log sees a Bridge to the right it will erase itself)*:

![Log Behavior Editor](image)

153. Test this rule by moving the Frog with the Arrow tool to the edge of the River.
154. Then, click the Run button and use the Up Arrow on the keyboard and move the Frog onto a Log.

### Create Turtle and Island Agents

155. Create an Inflatable Turtle Agent. Select Animals from column 2 and Turtle from column 3. Save the Agent as Turtle.
156. Create an Inflatable Island Agent. Select Landscape from column 2 and Island from column 3. Save the Agent as Island.
157. Add a couple of Islands to the World using the Pencil tool. Save the World with these changes.

### Add Island and Turtle Behaviors

158. This time we’ll program from right to left, with the Arrow tool select an Island on the right.
159. In the Island Behavior Editor window, add a rule as follows *(If the Island sees water to the left once every 0.5 seconds with 20 percent chance then create a new Turtle to the left)*:

![Island Behavior Editor](image)

160. Select the Turtle Agent from the Agents List and create the following two rules *(same as the Log Behavior except in opposite direction)*:
### Play the Game

161. Click the **Run button** to play the game.
162. Click **OK** to **Reset** the game.

### Add Plant Agent to World and Finish Game

163. Create a **Plant Agent** by selecting **Tile** from column 1, **Plants** in column 2 and select **Untrimmed Hedge** from column 3. **Name** the **Agent Plant**.
164. Add **Hedges** using the **Pencil tool** to the **World**.
165. **Save** the **World** with these changes.