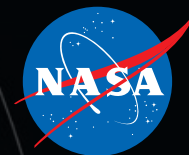


National Aeronautics and  
Space Administration



# ARTEMIS II CODING CHALLENGE



# ARTEMIS II CODING CHALLENGE GUIDE

Four astronauts will venture around the Moon on **Artemis II**, the first crewed mission on NASA's path to establishing a long-term presence at the Moon for science and exploration through Artemis.

The approximately 10-day flight will test NASA's foundational human deep space exploration capabilities, the **Space Launch System** rocket and **Orion** spacecraft, for the first time with astronauts and will pave the way for lunar surface missions, including landing the first woman and first person of color on the Moon.

Students will utilize block code to envision the Artemis II mission. The activity will allow students to learn about the crew members, liftoff into space and splashdown in the Pacific Ocean. The Artemis II mission is scheduled to launch no earlier than November 2024.

To complete this coding challenge, students will need to access a block code platform. In this guide, Code.org's "App Lab" is used as an example to follow along.

Code.org's "App Lab" can be accessed through the following link: <https://code.org/educate/applab>. You will need to create an account to proceed and start on a new blank project. Once logged in, click the create tab in upper right, followed by App Lab.

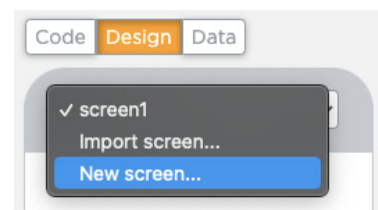


**CODE.ORG**

All resources to complete the app can be found in the file downloaded from the App Development Challenge Website.

## Part I: Designing the App

1. There are three tabs on top of the phone screen: "Code, Design, Data". Make sure you are in Design mode. In the drop down menu of "screen 1", press "New screen". Repeat this step 6 more times until you have a total of 7 screens.
2. The design toolbox has all the elements you will need to design and set up the app. This is where you will find elements such as image, label, button, and more.
3. For **screen1**, rename the id to **1crew**. Set the background color rgb(115, 165, 240).



a. Drag an Image icon to the screen: Id: Crew Width (px): 170 Height (px): 155 X position: 75 Y position: -90 Choose the image as crew.png	b. Drag an Image icon to the screen: Id: adclogo Width (px): 75 Height (px): 75 X position: 240 Y position: 5 Choose the image as adclogo.png
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<p>c. Drag a Label icon to the screen:</p> <p>Id: crewlabel  Text: Artemis II Crew Members Selected  Width (px): 180  Height (px): 45  X position (px) 70  Y position (px): 100  Text Color: rgb(255, 255, 255)  Font Size (px): 18  Background color: rgb(0, 0, 0)</p>	<p>d. Drag a Label icon to the screen:</p> <p>Id: crewinfo  Text: Click here for more info on crew members  Width (px): 145  Height (px): 85  X position: 90  Y position: 315  Text Color: rgb(255, 255, 255)  Font Size (px): 18  Background Color: rgb(0, 0, 0)</p>
<p>e. Drag a Button icon to the screen:</p> <p>Text: Next Step  Width (px): 100  Height (px): 40  X position: 215  Y position: 405  Text Color: rgb(255, 255, 255)  Background Color: rgb(245, 115, 15)  Border Color: rgb(0, 0, 0)</p>	<p>f. Drag a Label icon to the screen:</p> <p>Text: Press the down key to move the Crew icon to the red dot  Width (px): 205  Height (px): 30  X position: 5  Y position: 410  Text Color: rgb(0, 0, 0)  Background Color: rgb(255, 255, 255)  Font Size (px): 13</p>
<p>a. Drag an Image icon to the screen:</p> <p>Width (px): 25  Height (px): 25  X position: 145  Y position: 225  Choose the image as  icon://fa-circle  Icon color: rgb(255, 0, 0)</p>	

4. For **screen2**, rename the id to **2liftoff**. Set the background color to rgb(115, 165, 240).

<p>a. Drag an Image icon to the screen:</p> <p>Id: florida  Width (px): 190  Height (px): 170  X position: 5  Y position: 280  Choose the image as florida.png</p>	<p>b. Drag an Image icon to the screen:</p> <p>Id: SLS  Width (px): 100  Height (px): 150  X position: 75  Y position: 165  Choose the image as sls.png</p>
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<p>c. Drag an Image icon to the screen:</p> <p>Id: star</p> <p>Width (px): 25</p> <p>Height (px): 25</p> <p>X position: 150</p> <p>Y position: 325</p> <p>Icon Color: rgb(255, 0, 0)</p> <p>Choose the image as icon://fa-star</p>	<p>d. Drag a Label icon to the screen:</p> <p>Id: nasacenter</p> <p>Text: Kennedy Space Center</p> <p>Width (px): 110</p> <p>Height (px): 30</p> <p>X position: 180</p> <p>Y position 325</p> <p>Text Color: rgb(255, 255, 255)</p> <p>Font Size (px): 13</p> <p>Background Color: rgb(0, 0, 0)</p> <p>Border Color: rgb(0, 0, 0)</p>
<p>e. Drag a Label icon to the screen:</p> <p>Id: sls</p> <p>Text: Click here for more info on the Space Launch System (SLS)</p> <p>Width (px): 120</p> <p>Height (px): 80</p> <p>X position: 190</p> <p>Y position: 10</p> <p>Text Color: rgb(255, 255, 255)</p> <p>Background Color: rgb(0, 0, 0)</p> <p>Border Color: rgb(0, 0, 0)</p> <p>Font Size (px): 15</p>	<p>f. Drag a Label icon to the screen:</p> <p>Text: Press the up key to launch the SLS towards the red dot</p> <p>Width (px): 95</p> <p>Height (px): 65</p> <p>X position: 220</p> <p>Y position: 380</p> <p>Text Color: rgb(0, 0, 0)</p> <p>Background Color: rgb(255, 255, 255)</p> <p>Font Size (px): 12</p> <p>Border Color: rgb(255, 255, 255)</p>
<p>g. Drag a Label icon to the screen:</p> <p>Text: Astronauts lift off from pad 39B</p> <p>Width (px): 95</p> <p>Height (px): 60</p> <p>X position: 5</p> <p>Y position: 10</p> <p>Text Color: rgb(255, 255, 255)</p> <p>Background Color: rgb(0, 0, 0)</p> <p>Border Color: rgb(0, 0, 0)</p> <p>Font Size (px): 13</p>	<p>h. Drag a Button icon to the screen:</p> <p>Text: Next Step</p> <p>Width (px): 100</p> <p>Height (px): 40</p> <p>X position: 5</p> <p>Y position: 405</p> <p>Text Color: rgb(255, 255, 255)</p> <p>Background Color: rgb(245, 115, 15)</p> <p>Border Color: rgb(0, 0, 0)</p>
<p>i. Drag an Image icon to the screen:</p> <p>Width (px): 20</p> <p>Height (px): 20</p> <p>X position: 130</p> <p>Y position: 5</p> <p>Choose the image as icon://fa-circle</p> <p>Icon color: rgb(255, 0, 0)</p>	

5. For **screen3**, rename the id to **3triptomoon**. Set the background color to `rgb(0, 0, 0)`

<p>a. Drag an Image icon to the screen:</p> <p>Id: moon Width (px): 90 Height (px): 80 X position: 115 Y position: 365 Choose the image as moon.png</p>	<p>b. Drag an Image icon to the screen:</p> <p>Id: earth Width (px): 145 Height (px): 145 X position: 85 Y Position: 0 Choose the image as earth.png</p>
<p>c. Drag an Image icon to the screen:</p> <p>Id: orion Width (px): 95 Height (px): 90 X position: 105 Y position: 75 Choose the image as orion.png</p>	<p>d. Drag a Button icon to the screen:</p> <p>Text: Next Step Width (px): 100 Height (px): 40 X position: 215 Y position: 40 Text Color: <code>rgb(255, 255, 255)</code> Background Color: <code>rgb(245, 115, 15)</code> Border Color: <code>rgb(0, 0, 0)</code></p>
<p>e. Drag a Label icon to the screen:</p> <p>Text: Move Orion with computer keys towards each red dot Width (px): 95 Height (px): 90 X position: 220 Y position: 355 Text Color: <code>rgb(0, 0, 0)</code> Background Color: <code>rgb(255, 255, 255)</code> Font Size (px): 12</p>	

6. For **screen4**, rename the id to **4splashdown**. Set the background color to `rgb(115, 165, 240)`.

<p>a. Drag an Image icon to the screen:</p> <p>Id: parachute Width (px): 190 Height (px): 165 X position: 70 Y position: -70 Choose the image as parachute.png</p>	<p>b. Drag an Image icon to the screen:</p> <p>Id: waves Width (px): 255 Height (px): 175 X position: 30 Y position: 240 Choose the image as waves.png</p>
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<p>c. Drag a Label icon to the screen:</p> <p>Id: endmission</p> <p>Text: Artemis II ends in the Pacific Ocean</p> <p>Width (px): 285</p> <p>Height (px): 20</p> <p>X position: 20</p> <p>Y position: 425</p> <p>Text Color: rgb(255, 255, 255)</p> <p>Background Color: rgb(25, 85, 180)</p> <p>Border Color: rgb(25, 85, 180)</p>	<p>d. Drag a Button icon the screen:</p> <p>Text: Next Step</p> <p>Width (px): 100</p> <p>Height (px): 40</p> <p>X position: 10</p> <p>Y position: 10</p> <p>Text Color: rgb(255, 255, 255)</p> <p>Background Color: rgb(245, 115, 15)</p> <p>Border Color: rgb(0, 0, 0)</p>
<p>e. Drag a Label icon to the screen:</p> <p>Text: Press the down key to move the Orion parachute towards the ocean</p> <p>Width (px): 100</p> <p>Height (px): 95</p> <p>X position: 215</p> <p>Y position: 5</p> <p>Text Color: rgb(0, 0, 0)</p> <p>Background Color: (255, 255, 255)</p> <p>Font Size (px): 13</p>	

7. For **screen5**, rename the id to **5educational**. Set the background color to rgb(0, 0, 0)

<p>a. Drag a Label icon to the screen:</p> <p>Id: missionmap</p> <p>Text: Click here to view the Artemis II Mission Map</p> <p>Width (px): 140</p> <p>Height (px): 95</p> <p>X position: 90</p> <p>Y position: 65</p> <p>Text Color: rgb(255, 255, 255)</p>	<p>b. Drag a Label icon to the screen:</p> <p>Id: missionoverview</p> <p>Text: Click here to read the Artemis II Mission Overview</p> <p>Width (px): 130</p> <p>Height (px): 100</p> <p>X position: 90</p> <p>Y position: 220</p> <p>Text Color: rgb(255, 255, 255)</p>
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## Part II: Creating the code

- Before beginning, it is important to note the color importance. For example, purple commands are found in the purple "Variables" section in the Toolbox. Blue commands are found in the blue "Control" section in the Toolbox. The same applies to other respective colors and where you can locate them in the Toolbox.
- The first part of any code is to declare your variables. To do so, go to the Variables section and drag to the workspace. `var x = 0;` Replace the x with yVel and put 0 (zero) after the equal sign. Repeat for setting xVel to 0 (zero).
- Next, we want to tell the computer which screen we are on. Under UI controls drag `setScreen(screenId)` and place under the last variable declared. ScreenId will change to screen1. Use the down arrow and select **1crew**.
- Next, we want to hide the "Next step" button element when starting each screen. `hideElement("button1");` Use this command and select 'button1' to hide your orange Next Step button until the user completes the action item on the app.

5. To start the action part of the code, we always declare onEvent command found in the UI controls section.

`onEvent(id, type, callback)` We set the id to "1crew" and the type to "keydown". Fill in the white bubble next to function with "event".

a. Right now, our crew members image is positioned at the top of the screen. We want to move it down.

b. Drag "if / else" statement from the Control menu. Drag `==` from the Math section into the white bubble next to the if. In the first white bubble of the == type: event.key, in the second bubble type: "Down".

c. Drag `x = 0;` from the Variable section to the white space underneath the if. Replace x with "yVel" and the second bubble with 10. Repeat with the else statement, replacing the x with "yVel" and -10 in the second bubble.

d. Now, we need to move the crew image. We do this by dragging

`setPosition(▼"id", 0, 0, 100, 100);` from the UI Controls to under the blue if/else block. Set id to crew. The first 0 is the new x-position which does not change so we drag `getXPosition(id)` from UI Control and choose crew. The second 0 is for y-position, which we want to change. Drag `0 + 0` from the Math section and place it into the second zero. Drag `getYPosition(id)` from UI control and place it into the first addition bubble. Type yVel in the second addition bubble. Finally, we do not need the two 100s at the end. To get rid of them click the left arrow next to the 100 twice. `);`

e. Next, we want to make our label "Click here for more information on crew members" interactive. So, using another onEvent command, set the id to "crewinfo" and keep the type on "click". Inside this block, drag the `open(url)` from the UI Controls section and insert the following link: <https://www.nasa.gov/press-release/nasa-names-astronauts-to-next-moon-mission-first-crew-under-artemis/>

```
var yVel = 0;
var xVel = 0;
setScreen(▼"1crew");
onEvent(▼"1crew", ▼"keydown", function(event) {
  hideElement(▼"button1");
  if (event.key == "Down") {
    yVel = 10;
  } else {
    yVel = -10;
  }
  setPosition(▼"Crew", getXPosition(▼"Crew"), getYPosition(▼"Crew") + yVel);
  if (getYPosition(▼"Crew") == 150) {
    showElement(▼"button1");
  }
});
onEvent(▼"crewinfo", ▼"click", function() {
  open("https://www.nasa.gov/press-release/nasa-names-astronauts-to-next-moon-mission-first-crew-under-artemis/");
});
```

6. The user will want to press Next Step. We want to tell the computer to go to the next screen. Drag another onEvent command, place it below the last on OnEvent. Select the id as "button1" and type as "click". Drag a setScreen from UI Controls, select 2liftoff from the pull-down menu.

a. Now we want to move the rocket up. This will use same set of code as we did to move the crew down. Drag another onEvent command inside of this current one and set the id as "2liftoff" and the type as "keyup". Obtain the x and y position coordinates, attaching a Math function to the getYPosition for movement.

- b. Insert an if statement and declare the velocity. This is so the Space Launch System (SLS) will move upwards towards space and away from the Kennedy Space Center by pressing the Up key.
- c. Drag a UI control playSound and type the following: sound://category\_space/Launch\_SFX.mp3. This will play a liftoff launch sound so that while the code is running and you are pressing your Up key to move the spacecraft away from Kennedy Space Center, there will be sounds in the background.
- d. Next, we want to make our label “Click here for more info on the Space Launch System (SLS)” interactive. So, using another onEvent command, set the id to “slsinfo” and keep the type on “click”. Inside this block, using the open(url) command and insert the following link: <https://www.nasa.gov/exploration/systems/sls/index.html>

```

onEvent (▼ "button1", ▼ "click", function() {
  hideElement (▼ "button2");
  setScreen (▼ "2liftoff");
  onEvent (▼ "2liftoff", ▼ "keydown", function(event) {
    if (event.key == "Up") {
      yVel = -10;
    }
    setPosition (▼ "sls", getXPosition (▼ "sls"), getYPosition (▼ "sls") + yVel);
    if (getYPosition (▼ "sls") == 55) {
      showElement (▼ "button2");
    }
  });
  playSound (▼ "sound://category_space/Launch_SFX.mp3");
});
onEvent (▼ "slsinfo", ▼ "click", function() {
  open ("https://www.nasa.gov/exploration/systems/sls/index.html");
});

```

7. To begin the third screen, **3triptomoon**, drag a new onEvent command to the screen. Declare the id as “button2”, and type as “click”. This is so when you press the button Next Step on 2liftoff, it will change from 2liftoff to 3triptomoon. Use setScreen and select 3triptomoon.
  - a. Hide all the elements named “button3, toearth, toearthlabel, aroundmoon, aroundmoonlabel”.
  - b. Drag an onEvent command inside the current one. Declaring your xVel and yVel, use an if else statement to declare event.key for Right, Left, Up, and Down. This is so the Orion spacecraft can move in any direction on the app screen and follow the red dot.
  - c. Insert if else statement again and obtain your getXposition and getYposition for the Orion spacecraft in certain locations in the screen. The point of these repetitive steps is so that when Orion reaches a certain coordinate on the app screen (where the red dot is located), a new location to follow the path of and new label will appear. It will tell the story of the Orion journey to Moon, during its lunar flyby, and back to Earth.



- d. Finally in the end, you close out the if else statement by showing the last label “toearth” and the “button3” which allows the user to proceed forward to the Next Step after completing the whole trip around the Moon.

```

onEvent (▼"button2", ▼"click", function() {
  setScreen (▼"3triptomoon");
  hideElement (▼"toearth");
  hideElement (▼"toearthlabel");
  hideElement (▼"aroundmoon");
  hideElement (▼"aroundmoonlabel");
  hideElement (▼"button3");
  onEvent (▼"3triptomoon", ▼"keydown", function(event) {
    xVel = 0;
    yVel = 0;
    if (event.key == "Right") {
      xVel = 10;
      yVel = 10;
    }
    setPosition (▼"orion", getXPosition (▼"orion") + xVel, getYPosition (▼"orion") + yVel);
    if (getXPosition (▼"orion") == 170 && getYPosition (▼"orion") == 390) {
      hideElement (▼"tomoon");
      hideElement (▼"tomoonlabel");
      showElement (▼"aroundmoon");
      showElement (▼"aroundmoonlabel");
    } else if ((getXPosition (▼"orion") == 90 && getYPosition (▼"orion") == 390)) {
      hideElement (▼"aroundmoon");
      hideElement (▼"aroundmoonlabel");
      showElement (▼"toearth");
      showElement (▼"toearthlabel");
    } else if ((getXPosition (▼"orion") == 200 && getYPosition (▼"orion") == 90)) {
      hideElement (▼"toearth");
      showElement (▼"button3");
    }
  }
}

```

8. To begin the screen **4splashdown**, drag a new onEvent command to the screen. Declare the id as “button5”, and type as “click”. This is so when you press the button Next Step on 3triptomoon, it will change from the screen 3triptomoon to 4splashdown. Use setScreen and select 4splashdown. Hide the button4 element to prevent the user from proceeding to the final screen before finishing the action items.
- Drag an onEvent command inside the current one. Select the id as “6splashdown” and the type as “keydown”. List the function (event).
  - Insert an if statement and list the even.key as “Down”. Declare the y-velocity. This will demonstrate the spacecraft coming back to Earth for its splashdown into the Pacific Ocean. When pressing the down key, the spacecraft will move from the top of the screen to the bottom towards the waves.
  - Obtain the setPosition for the parachute, including the x and y position. Using an if statement, getYposition for

the parachute and write 100. So, when the parachute reaches this y-coordinate, we can then showElement for the Next Step button to proceed to the final screen.

- d. Lastly, drag a UI control playSound and type the following: sound://category\_background/ocean\_waves.mp3. This will play ocean waves sounds so that while the code is running and you are pressing your Down key for the spacecraft to splashdown in the Pacific Ocean, you will hear ocean wave sounds.

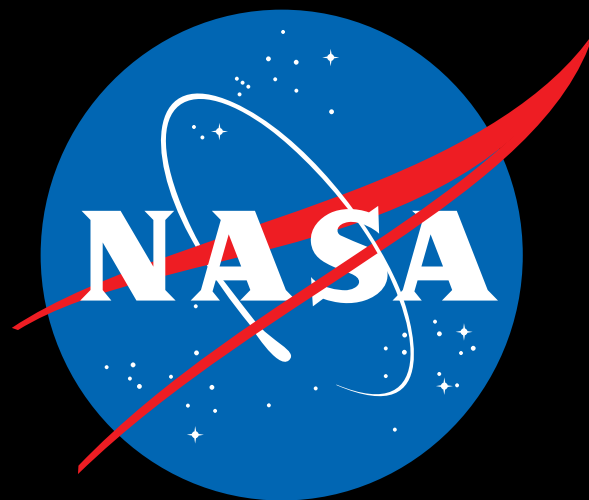
```
onEvent (▼ "button3", ▼ "click", function() {
  setScreen (▼ "4splashdown");
  hideElement (▼ "button4");
  onEvent (▼ "4splashdown", ▼ "keydown", function(event) {
    if (event.key == "Down") {
      yVel = 10;
    }
    setPosition (▼ "parachute", getXPosition (▼ "parachute"), getYPosition (▼ "parachute") + yVel);
    if (getYPosition (▼ "parachute") == 100) {
      showElement (▼ "button4");
    }
  });
  playSound (▼ "sound://category_background/ocean_waves.mp3");
});
```

9. To begin the screen **5educational**, drag a new onEvent command to the screen. Declare the id as “button4” and type as “click”. This is so when you press the button Next Step on 6splashdown, it will change 4splashdown to 5educational. Use setScreen and select 5educational.
  - a. We want to make our label “Click here to view the Artemis II Mission Map” interactive. So, using another on-Event command, set the id to “missionmap” and keep the type on “click”. Inside this block, using the open(url) command and insert the following link: <https://www.nasa.gov/image-feature/artemis-ii-map>
  - b. We want to make our label “Click here to read the Mission Overview” interactive. So, using another onEvent command, set the id to “missionoverview” and keep the type on “click”. Inside this block, using the open(url) command and insert the following link: <https://www.nasa.gov/feature/nasa-s-first-flight-with-crew-important-step-on-long-term-return-to-the-moon-missions-to>

```
onEvent (▼ "button4", ▼ "click", function() {
  setScreen (▼ "5educational");
  onEvent (▼ "missionmap", ▼ "click", function() {
    open ("https://www.nasa.gov/image-feature/artemis-ii-map");
  });
  onEvent (▼ "missionoverview", ▼ "click", function() {
    open ("https://www.nasa.gov/feature/nasa-s-first-flight-with-crew-important-step-on-long-term-return-t");
  });
});
```



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