

Course: Introduction to Physical Computing with Arduino I Module: Intro to Arduino



Lesson 1.1: Welcome to Arduino!

<https://codehs.com/course/8050/lesson/1.1>

Description	<p>In this first lesson, students will be introduced to Tinkercad, where they will build and test programs throughout the course. They will also do preliminary research on various Arduino example projects and set their goals for the course.</p>
Objective	<p>Students will be able to:</p> <ul style="list-style-type: none"> • Articulate what physical computing is • Use Tinkercad to create a virtual circuit using various components
Activities	<p> 1.1.1 Video: Intro to Arduino 1.1.2 Free Response: Explore an Arduino Project 1.1.3 Free Response: Sezme: Memory Game 1.1.4 Video: Using Tinkercad 1.1.5 Notes: Sign Up on Tinkercad 1.1.6 Connection: Exploration: Tinkercad 1.1.7 Video: Exploration 1.1 Follow-up 1.1.8 Free Response: Background & Experience 1.1.9 Free Response: Goal Setting </p>
Prior Knowledge	<ul style="list-style-type: none"> • Students should have some knowledge of the following topics before beginning this course: <ul style="list-style-type: none"> ◦ Variables ◦ Functions and Parameters ◦ Loops ◦ Conditionals • Alternatively, students could be concurrently taking a programming course that will teach these concepts prior to reaching the same topics in this course.
Planning Notes	<ul style="list-style-type: none"> • Depending on student experience (both with physical computing and with CodeHS) and activity decisions, this lesson may take up to 2 class periods to complete. Be sure to plan enough time for students to feel comfortable with the material. • Students will need to run programs on Arduino Uno devices throughout the course and will need certain materials available to

create circuits. There is a full materials list available at codehs.com/arduino_materials.

- Students will develop programs in Tinkercad at Tinkercad.com. They will test and run programs here. Once their program is successful, they will copy and paste it into the CodeHS editor. Here, you will have a record of student progress and will be able to grade and give feedback on specific exercises, though you will be unable to run the student programs directly in the CodeHS editor. Due to this, autograders are not available for any exercise in this course.
- In order to access student work on Tinkercad, you'll need to first set up your class or group. Go to codehs.com/arduino_tinkercad for detailed information on how to do this.
- Students will need to have access to the Arduino software in order to upload programs to their physical devices. Go to codehs.com/arduino_software for detailed information about the software needed and the installation process.
- There is an *Exploration* document in this lesson. It is recommended that students complete this document physically (though virtual completion and submission is an option.)
 - Be sure to print the needed number of copies (1 per student or 1 per group) prior to class.
 - A teacher version that will give helpful teacher notes and tips is included in the resources section as well.
- There is a worksheet that accompanies the *Arduino Scavenger Hunt* activity. Be sure to print the necessary number of copies for your class.
 - Students may complete this activity individually or in pairs/groups.
- There is an optional *Goal Setting* handout in this lesson. If you will be using it with your students, be sure to print the needed number of copies (1 per student) prior to class.
- Consider teaching students how to read the color codes on resistors for themselves. Though this is not required knowledge for success in the course, it is a good way to make connections to other courses. [This site](#) is a great place to start!
- **Prep Arduino devices for *Arduino Scavenger Hunt*:** A program must be downloaded onto all Arduino devices before students can begin the *Arduino Scavenger Hunt* activity. This program and directions are given on the *Arduino Scavenger Hunt (teacher)* resource.

Standards Addressed

Teaching and Learning Strategies

Lesson Opener:

- *Arduino Scavenger Hunt* [10-15 mins]
 - Give out worksheets and Arduino devices and battery packs/USB cords to individuals or student pairs/groups with the preloaded program. Allow students time to explore the program and device.

- Once students have completed the worksheet, have groups share their answers with the class so they every student is able to answer the questions correctly.

Activities:

- Watch the *Intro to Arduino* video as a class. [3-4 mins]
- Have students view the *Explore an Arduino Project* resource and answer the accompanying questions. [5-7 mins]
- Have students view the *Sezme: Memory Game* resource in pairs and answer the accompanying questions. [5-10 mins]
 - *Optional:* you might want to have this game set up on a classroom device (with accompanying circuit built) for students to explore physically. If so, pass the device around to each group for inspection.
- Watch the *Using Tinkercad* video as a class. [2-3 mins]
- Have students follow the instructions to sign into Tinkercad. [3-5 mins]
 - **Note:** Students will need to be provided with a code to connect to their Tinkercad classroom or Tinkercad group.
 - If using Tinkercad classrooms, students will need to enter their class code every time they log in to the site, so it would be helpful to place this in a place that is always available to students and/or instruct them to record it in a safe place for themselves.
- Have students complete the *Exploration* individually or with a partner or group. [15-30 mins]
 - Though it is suggested that students fill out a printed version of the document, they can also complete the questions on the virtual document and submit the link to you. If you choose this process, be sure to show them exactly how to do this before they begin.
- Students complete the *Background & Experience* free-response questions. [5-10 mins]
 - The answers to these questions can help you break students into varying differentiation groups, determine which students to group together as the course progresses, or which topics you may need to revisit or which students to assign review problems to before they are reached in this course.
 - Note: codehs.com/practice allows you to assign problems to your students to help them review specific concepts in various programming languages.
- Students complete the *Goal Setting* free-response questions. [5-10 mins]
 - You may want to have students set their goals for the course using the accompanying *Goal Setting* worksheet. This can be an expansion of student answers from the *Goal Setting* exercise.
 - These worksheets can be printed out and hung around the room to remind students of their goals throughout the year.

Lesson Closer:

- Have students reflect and discuss their responses to the end of class discussion questions. [5 mins]

Discussion Questions

Beginning of Class:

- See *Arduino Scavenger Hunt* worksheet.

End of Class:

- What does it mean for a robot to 'sense', 'think', and 'act'? Give an example of this process in a driverless car (you can use any system you think a driverless car would need in order to be successful.)
 - *A robot first senses its surroundings using a sensor, thinks about the information it received based on the program written, and then performs a certain action. Ex: A driverless car senses if there is an object in front of the car. The program tells the car to stop moving if there is an object so the car acts on this when it sees an object and applies the brakes. (Answers may vary)*
- Why is the Tinkercad site useful to us? What does it allow us to do?
 - *Tinkercad allows us to simulate our circuits so we can test them before building using physical components.*

Resources/Handouts

[Goal Setting_\(teacher\)](#).

[Goal Setting_\(student\)](#).

[Exploration: Tinkercad_\(student\)](#).

[Exploration: Tinkercad_\(teacher\)](#).

[Arduino Scavenger Hunt_\(student\)](#).

[Arduino Scavenger Hunt_\(teacher\)](#).

[Arduino Materials List](#)

[Arduino Tinkercad Instructions](#)

[Arduino Software Instructions](#)

[Arduino Reference Sheet](#)

Vocabulary

Term

Definition

Modification: Advanced	Modification: Special Education	Modification: English Language Learners
<ul style="list-style-type: none">• Encourage students to look more closely at the <i>Sezme: Memory Game</i> code and see if they can make small alterations to the program.	<ul style="list-style-type: none">• Have students work in pairs to complete the Exploration activity.• Assign some practice problems to students to give them a chance to review foundational computer science topics.	<ul style="list-style-type: none">• Allow students to use closed captioning when viewing the videos.