**AP CSP CodeX**

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| **MISSION 6 Obj 8-11 Heartbeat** | | **Time: 45 minutes** |
| **Project Goal:** Students will use a variable and images in an infinite loop to create a beating heart animation.  **Learning Targets**   * I can apply variables to a new program. * I can update the value of a variable using math * I can program using *float values.* | **Key Concepts**   * Use a **variable** to hold the *current state* of your program. In this case it’s the speed of the heartbeat, or to be specific the *delay* between beats. * An infinite loop is a good way to continuously check for button presses, which lets the CodeX act on events as they occur. | |
| **Assessment Opportunities**   * Mission 6 Obj 8-11 Assignment * Heart2\_functions program (final) | **Success Criteria**   * Include code in the program that speeds up and slows down the heart * Create a function for the code that updates the delay variable | |
| **AP CSP Framework**  **AAP-1.JC** Evaluate expressions that use arithmetic operators.  **AAP-1.J** Write iteration statements. Determine the result or side effect of iteration statements.  **AAP-3.C** Develop procedural abstractions to manage complexity in a program by writing procedures.  **Computational Thinking Practice 3.B** Use abstraction to manage complexity in a program.  **Computational Thinking Practice 4.C** Identify and correct errors in algorithms and programs, including error discovery through testing. | **Materials**   * Mission 6 Obj 8-11 Assignment / Answers * AP CSP CodeX Vocabulary List * AP CSP CodeX Python Code List * Unit 2 Review Links and Test Questions * [Mission 6 Kahoot Review (all)](https://create.kahoot.it/share/firia-labs-mission-6/7bf069b2-892b-4db9-89f7-10738cbdbc63) | |
| **Teacher Notes**   * Start the lesson by having students open their program from the last lesson (Mission 6 Obj 1-7) Heart2\_functions * The assignment is best completed digitally. Prepare the assignment for distributing through your LMS. * After Objective 11 and the quiz, students continue with the code to create and use a function. This is extended beyond the instructions in CodeSpace. Students can stay in Obj. 11 or move to the sandbox. You can encourage your students to do this extension on their own, or give them the instructions for creating a function. This is all practice in preparation for the Create PT. * At the end of the lesson, discuss clearing the CodeX before turning it in. * If you have time at the end of the lesson, use the [Mission 6 Kahoot Review](https://create.kahoot.it/share/firia-labs-mission-6/7bf069b2-892b-4db9-89f7-10738cbdbc63). * Another suggestion for assessment is for students to keep a daily journal, or use a reflection form for students to process information they learned and reflect on questions they may still have. * You may consider having students (or the class collectively) keep a chart of errors and the ways to fix them. * You can also add vocabulary to a word wall and keep a document or chart of the Python code learned during each mission. * Refer to the Python with CodeX Curriculum Guide or Mission 6 Lesson Prep (found in the l[earning portal](https://learn.firialabs.com/curricula/python-with-codex/teachers-resources/codex-teacher-materials)) for more information. * The teaching guide (below) gives the narration for one way to present the lesson. | | |

**Teaching Guide**

**Warm-up (5 minutes)**

🧑‍🤝‍🧑 **Discuss** – Use a discussion strategy, like journaling, working at boards, selecting random students, or a form of think-pair-share.

* Topic: Review what students have learned so far in Mission 6.

**Activity – Mission #6 Objectives 8-11 (30 minutes)**

💻 Randomly group students into pairs for pair programming (or they can work individually).

Students log in to one computer. Two computers can be used if they want to have the activity guide open on one computer and CodeSpace on the other computer.

Students go to [make.firialabs.com](http://make.firialabs.com) and start in Mission 6 at Objective 8. Students open their heart2\_functions program.

💡 **Teaching tip – Objective 8:**

Students learn another data type: float. A float is a decimal number. It is called “float” because the numbers have a decimal, or “floating point”. You can have a short discussion about this if needed. Python is not very specific about integers and floats and the need to convert from one to the other. But other programming languages are very strict about data types, and data type conversion would have to happen for variables of different data types to work together. To convert a value to integer, use: int(). To convert a value to float, use: float().

💡 **Teaching tip – Objective 9:**

Review of variables. First introduced in Mission 3 (Light Show) Objective 8.

💡 **Teaching tip – Objective 10:**

The instructions in the assignment are slightly different from CodeTrek. Students have already changed the button used to break the loop. The goal says to “Remove break”, but they should not do that!

💡 **Teaching tip – Objective 11:**

This code for this objective will cause an error. That is one of the goals to achieve. Students will record their error in the assignment. Then, after the objective they will go to the sandbox and fix the error.

**Activity – After Objective 11 (10 minutes)**

💡 **Teaching tip – After Objective 11:**

For practice with functions, students should create a function for the code that speeds up and slows down the heart beat. Then call the function in the infinite loop. Students should be able to do this step on their own. Encourage students to do this on their own before reading the instructions on the assignment.

Students are also asked to fix the error in the new function. One way to do this is described in the assignment. But there are other ways. Challenge students to come up with their own way to solve the problem.

Students should test their code and debug any errors before submitting and going to the next lesson.

EXTENSION: Create a flowchart of the program.

✅ Assignment is complete and ready to turn in.

**Wrap-Up (5 minutes)**

Use a formative assessment for the wrap-up.

✅ **IMPORTANT!!**

* Remind students to clear their CodeX.

Formative Assessment:

* Daily reflection journal
* [Mission 6 Kahoot Review](https://create.kahoot.it/share/firia-labs-mission-6/7bf069b2-892b-4db9-89f7-10738cbdbc63) (in class or individual)
* Exit ticket on incrementing and decrementing
* Exit ticket on data types
* Group review on incrementing, decrementing and data types.

**SUCCESS CRITERIA:**

* Create a program that shows a beating heart using an infinite loop
* Include code in the program that speeds up and slows down the heart
* Create and call a function for adjusting the speed of the animation
* Add code so the program doesn’t crash