**AP CSP CodeX**

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| **MISSION 9 Game Spinner** | | **Time: 45 minutes** |
| **Project Goal:** Students will use a list, functions and while loops to animate the arrow of a game spinner.  **Learning Targets**   * I can apply properties and uses of an index to a new program. * I can define and call a function. * I can utilize multiple variables to a new program and describe their purposes. * I can utilize loops to make my code more efficient. * I can create simulations using computer hardware and software. | **Key Concepts**   * Logical operators like ‘and’, ‘or’, and ‘not’ allow your code to test for multiple conditions. * Define functions to break complex code into smaller, easy to use (and re-use) pieces. * Detect instantaneous button presses with button.is\_pressed() * Make your own animated sequences with loops and index variables. * Loop for a determined number of iterations: while index < N | |
| **Assessment Opportunities**   * Mission 9 Assignment * Game\_Spinner program | **Success Criteria**   * Display a random arrow from a list * Detect a press from either BTN-A or BTN-B * Use a loop to animate an arrow spinning * Use local variables to increase the number of loops and the length of the delay | |
| **AP CSP Framework**  **AAP-2.F** Write expressions using logical operators, and evaluate expressions that use logic operators.  **AAP-3.B** Explain how the use of procedural abstraction manages complexity in a program.  **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 9 Assignment / Answers * AP CSP CodeX Vocabulary List * AP CSP CodeX Python Code List * Unit 3 Review Links and Test Questions * [Mission 9 Kahoot Review](https://create.kahoot.it/share/firia-labs-mission-9/6d47a695-09a7-49f0-ac44-fce2d24f7fb1) * Solution code   + Game\_Spinner | |
| **Teacher Notes**   * The assignment is best completed digitally. Prepare the assignment for distributing through your LMS. * This lesson introduces functions, but it will be mostly review for your students. * Encourage the students to do as much code on their own as they can, and use the CodeTrek to check their work, or as a hint when needed. * The assignment adds an extra step to complete after Objective 8, before turning in the program. * Extensions are given in the teaching guide (but not the assignment) for any students finishing the program and having extra time. * If you have time at the end of the lesson, use the [Mission 9 Kahoot Review](https://create.kahoot.it/share/firia-labs-mission-9/6d47a695-09a7-49f0-ac44-fce2d24f7fb1). * 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 9 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**

The actual coding part of this Mission is about one normal class period.

**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:** There isn’t a specific warm-up for this lesson. As a teacher, decide on a topic that may need review with your students before starting the mission. You may want to review functions, or lists and indexes. Or you can go over common programming errors. Spend five minutes or less doing a quick review and then get right to the mission.

**Activity – Mission #9 (45 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 should be at the beginning of Mission 9.

💡 **Teaching tip – Objective 1:**

The objective uses a built-in arrow list. If students don’t read the instructions carefully, they will create the list. They do not need to! They should use their knowledge (and code if necessary) to display a random arrow from the built-in list.

💡 **Teaching tip – Objective 3:**

This objective is all about functions. This should be a review, since students have been working with functions for quite some time. See how much they remember and can do on their own.

💡 **Teaching tip – Objective 5:**

This objective introduces more vocabulary: simulation, parameter, and argument. Future lessons will cover parameters, arguments and local variables in more detail. Treat this objective as an introduction to them, knowing there is more to come.

💡 **Teaching tip – Objective 6:**

This objective uses the debugger. If students haven’t used it for a while, you may need to give them a refresher. Or go through the debugger on a big screen for all the students. They will still need to do it individually to meet the goal. The hint explains when to press a button so the function is called.

This objective will cause an error! It is fixed in the next objective.

💡 **Teaching tip – Objective 7 & 8:**

These objectives are mostly review and shouldn’t take a long time.

💡 **Teaching tip – After Objective 8:**

The students will use modulo division in the program to keep the index in range. This is similar to the program they modified for practice in the “Types of Division” lesson.

**Extensions – After Objective 8** (if Mission 8 takes up the entire class period, skip this all together)

💡 **Possible extensions for students who finish and have extra time:**

* Add a “kill switch” to stop the loop and end the program.
* Add audio to the game spinner, something like a click or beep each time the arrow moves.
* Use one button to spin clockwise and another button to spin counterclockwise.

No example solutions are given for the extensions.

✅ Assignment is complete and ready to turn in.

**Wrap-Up (5 minutes – optional)**

Use a formative assessment for the wrap-up.

✅ **IMPORTANT!!**

* Remind students to clear their CodeX.

Formative Assessment:

* Daily reflection journal
* Mission 9 Kahoot Review (in class or individual)
* Exit ticket or group review on functions or local variables, or loop conditions

**SUCCESS CRITERIA:**

* Display a random arrow from a list
* Detect a press from either BTN-A or BTN-B
* Use a loop to animate an arrow spinning
* Use a local variable to increase the number of loops
* Use a local variable to increase the length of the delay
* Use modulo division to keep the index in range