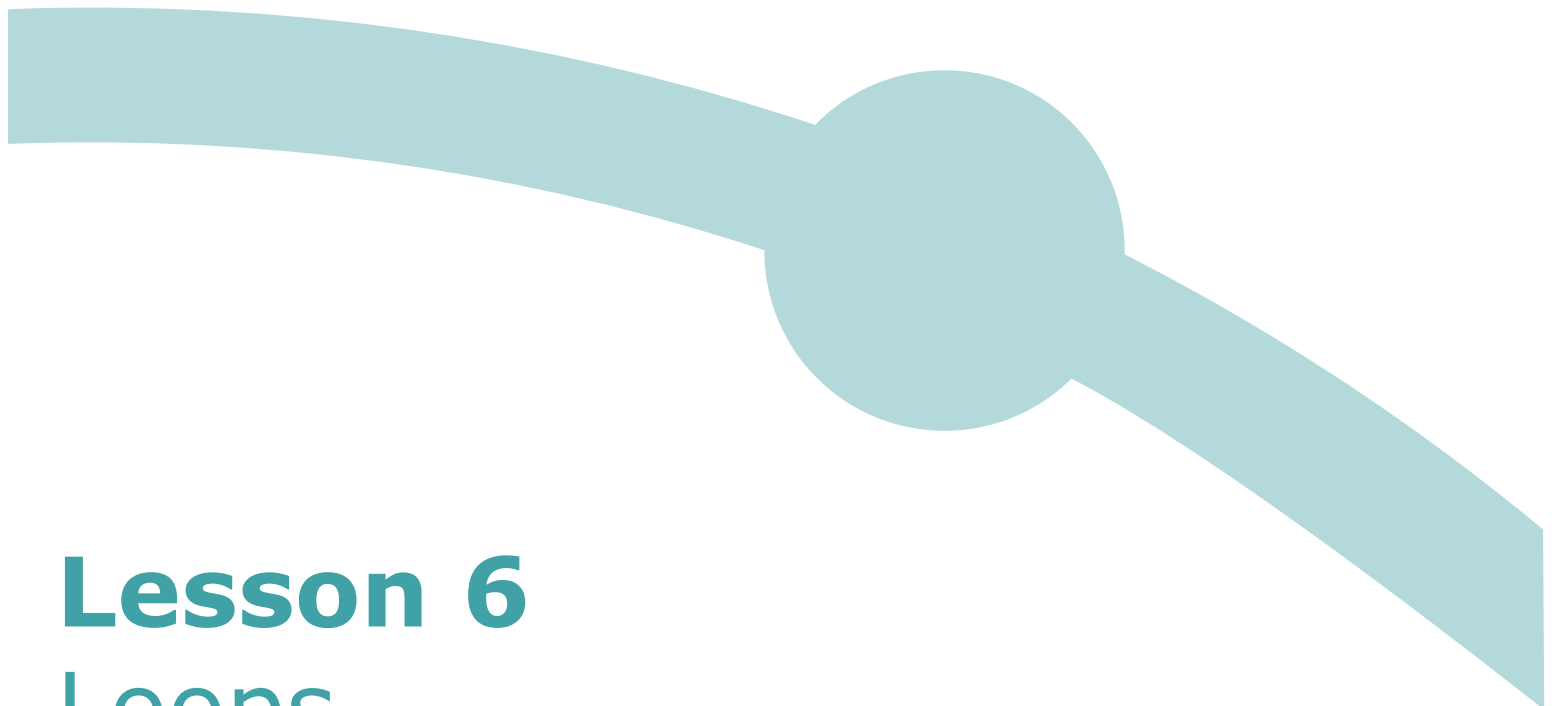


# code jumper



**Lesson 6**  
Loops

# Code Jumper Curriculum: Lessons



## Lesson 6 Loops

American Printing House for the Blind

*Code Jumper Curriculum: Lessons*

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# OVERVIEW

## LESSON OBJECTIVES

Students will:

- Understand that the loop command in computer programs is a repetition
- Learn how to create programs using the loop command

## EXPECTED OUTCOMES

Students will:

- All students: Explain what a loop command is and why we use it
- Most students: Recreate a programming sequence using a loop command
- Some students: Create an original sequence requiring a loop command

## LESSON PLAN STRUCTURE

- Unplugged Activity
- Guided Code Jumper Activity
- Exploration
- Standards and Check for Understanding

## KEY VOCABULARY

**Loop:** A way to organize commands in a computer program so they repeat a sequence of instructions a required number of times. In the case of the Code Jumper Loop pod, the loop will continue to repeat the sequence a set number of times.

**Repetition:** Repeating a set of commands in a computer program using a loop.

## RESOURCES

- Code Jumper Tutorial Videos
  - The Hub: <https://www.youtube.com/watch?v=KGb51PW9zJQ&lis=>
  - Play and Pause Pod: <https://www.youtube.com/watch?v=446jCw8qcDI&t=>
  - Loop Pod: <https://www.youtube.com/watch?v=EFKbKLID3HI>
- Code Cards

## INSTRUCTION FOR SET UP

- Sample program set up and run by the teacher: Counting to Three Looped
  - Sound Set: Sample Sounds: Numbers in Thread 1

THREAD 1 Numbers

LOOP 4 times

PLAY One at 1 times speed

PLAY Two at 1 times speed

PLAY Three at 1 times speed

END LOOP

END THREAD

- Program to be run by the teacher:

Sound Set: Sample Sounds: Percussion on Thread 2

THREAD 2 Percussion

LOOP 6 times

PLAY Snare-Drum for 1 times speed

PLAY Hi-Hat 2 for 1.5 times speed

END LOOP

END THREAD

# UNPLUGGED ACTIVITY: IDENTIFYING REPETITION

## OBJECTIVE

Introduce the students to the concept of a loop and how it can be modified to repeat a series of steps a required number of times.

## VOCABULARY

**Loop:** A way to organize commands in a computer program so they repeat a sequence of instructions a required number of times. In the case of the Code Jumper Loop pod, the loop will continue to repeat the sequence a set number of times.

**Repetition:** Repeating a set of commands in a computer program using a loop.

## MATERIALS

- Computer Science Journals
- White boards (one per group) / White board markers (one per group)
- Computer
- Determine recording materials needed to fit the specific needs of the classroom

## INSTRUCTION

1. Divide students into groups of three to five depending on the size of the class.
2. Have the students sit together in small groups around the white board, and choose one person in their group to write down their ideas in the following activity.
3. Explain that each group will report their ideas to the class and the teacher will then record each group's suggestions by either writing on a classroom whiteboard or projecting it on a screen.

4. Ask each group to record on their white boards three ideas of things they have to do multiple times in a row. (Examples: Doing math problems, handing out papers, setting table places, jumping rope, running laps around the gym, shooting a basketball, practicing a piano piece.)
5. Once each group has three ideas, bring the class back together and ask one person from each group to report their group's ideas. Record the ideas on the classroom whiteboard or projector.
6. Instruct students to write in their Computer Science Journals the list of ideas reported as a class to help them remember examples of repetitive tasks or loops.
7. Explain to students that there are often tasks we are asked to complete a certain number of times or until the job is done. For example, if they were told to move boxes from one place to another, they wouldn't take one box and then stop until they were told to move another box. Instead, they would move the boxes until there were not any more boxes left to move.
8. Tell students that tasks they have to do over and over are called repetitive tasks, or loops, in computer programming.
9. Explain that computers are very good at repetitive tasks because computers don't get bored or tired, and they are very good at doing things exactly the same way every time they are told.

## CLOSURE

Tell students that in computer programming, repetitive tasks are called loops. When students use a loop command, the sequence will continue to repeat until it is told to stop, based on the number of times they have programmed it to run.

# GUIDED ACTIVITY: MAKING A COMPUTER REPEAT COMMANDS

## OBJECTIVE

Students will:

- Identify commands that repeat
- Be introduced to the loop command and how to put the commands that need to be repeated inside a loop

## VOCABULARY

**Loop:** A way to organize commands in a computer program so they repeat a sequence of instructions a required number of times. In the case of the Code Jumper Loop pod, the loop will continue to repeat the sequence a set number of times.

**Repetition:** Repeating a set of commands in a computer program using a loop.

## MATERIALS

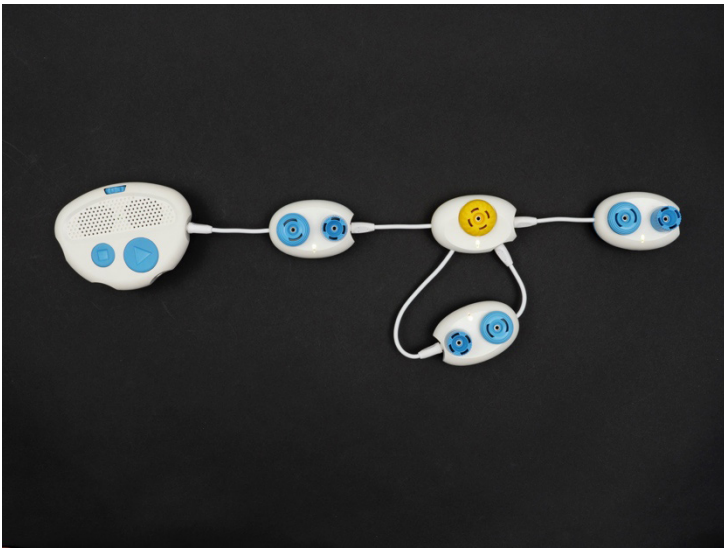
- Computer Science Journal
- Loops Code Card: Counting to Three, Looped

## INSTRUCTIONS

1. Introduce to students the idea of playing the same thing more than one time. Explain that a loop allows a programmer to do the same action multiple times in a row.
2. Ask students to think about and record in their Computer Science Journals how to get Code Jumper to play the sequence of numbers 1, 2, 3, 4 three times in a row.
3. Divide students into groups of two to three. In their groups, ask students to pull out all of their Play pods and the Hub and try to create the program using only the Play pods.

4. Regroup and discuss the students' findings. Ask students: Did it work? Were you able to create the count up to 3, four times? If not, why not? What else did you need that you did not have?
5. Introduce the Loop pod. Explain that a **loop** can be used to repeat a set of commands. This is known as **repetition** in programming.
6. Instruct students to hold the Loop pod. Point out the Dial, the Cords, and the Ports. Explain that the shorter Cord is where the loop connects with the main program. The loop itself begins with the Command pod that's connected to the Port on the lower-right side of the Loop pod, and the loop ends with the Command pod that's connected to the Loop pod's longer Cord. Explain that the main program resumes with the Command pod that's connected to the Port on the upper-right side of the Loop pod. Explain that the Dial on the Loop pod allows you to choose how many times the loop will repeat.
7. **Tip!** When students begin creating a loop program, if possible, have the main program in a straight line and the loop extending below. This will demonstrate to the students that the loop is part of the program, but it then returns to the main program and continues.





[Figure Caption:] This is a photo of the Code Jumper Hub and four Command pods. One Play pod is connected directly to the Hub at Port 4. The Loop pod's shorter wire is connected to that Play pod's port, and the Loop pod's upper-right port is connected to another Play pod. Below this line of pods is the looped portion of the program. The Play pod in the loop is connected to the Loop pod's lower-right port and to the Loop pod's longer wire.

8. **Tip!** If you hear a burp sound, there is an error in your program. Check the loop to make sure that the Cords are all plugged in properly and that the Pods are connected correctly.
9. Ask students to create the Count Up to Four program using the Loop pod. Ask students to determine how many Play pods they will need when creating a program using a loop. Push the rest of the Play pods to the side.

```
Thread 3 Numbers
LOOP 4 times
  PLAY One for 1 times speed
  PLAY Two for 1 times speed
  PLAY Three for 1 times speed
END LOOP
End Thread
```



[Figure Caption:] At the top is a screenshot of the Code Jumper app with a program in Thread 3. Under Thread 3 Numbers, the commands read, LOOP 4 times, PLAY One for 1 times speed, PLAY Two for 1 times speed, PLAY Three for 1 times speed, END LOOP; the commands are followed by End Thread. Below the screenshot is a photo of the Code Jumper kit containing three Play pods and a Loop pod. The Loop pod is connected directly to the Hub at Port 2 by its shorter wire. The Play pods are connected, one after the other, to the Loop pod’s lower-right port and the Loop pod’s longer wire.

10. Determine the order that students will connect the Pods so everyone gets a turn. Point out that the loop runs clockwise, starting at the yellow Dial. The program goes out the port on the lower-right, through the Play pods, back to the Loop pod's longer cord on the lower-left, and back to the Dial. It repeats this as many times as it is told by the Dial on the Loop pod. When it is all done with the loops, the program continues to play whatever comes after the port on the upper right.
11. Once all the Pods are connected, run the program and debug, if necessary.
12. Ask the students to read the code in the Code Jumper app or by pressing the Play and Stop buttons on the Hub. Ask the students: How do you know that the play commands are inside the loop? How does the code differ from when there are just Play pods attached? (Expected response: They come between the Loop and End Loop statements.)
13. Students can now create a program with a loop on their own. Have students create a loop using any of the Sound Sets or record a local song or rhyme that has repetition.
14. Ask the question, what is the greatest number of times we can have a loop play with the Loop pod? Let them know that other computer programs can repeat commands millions of times!

## CLOSURE

- Ask the students to explain what repetition is and to give an example of how they used it in this lesson.
- Ask the students what they think the advantage is of using a loop. (Expected response: You can make a program that uses fewer commands.)

# EXPLORATION

## OBJECTIVE

Students will create a program with eight Play pods, set the sounds on each Pod, and run and trace the program.

## VOCABULARY

**Loop:** A way to organize commands in a computer program so they repeat a sequence of instructions a required number of times. In the case of the Code Jumper Loop pod, the loop will continue to repeat the sequence a set number of times.

**Repetition:** Repeating a set of commands in a computer program using a loop.

## MATERIALS

Exploration Code Card: Percussion

## INSTRUCTIONS

1. Have the students listen to the sample program: Exploration Code Card: Percussion
2. Ask the students the following questions. You may need to repeat the program after the questions are asked the first time.
  - a. Does the program use a loop? (Yes)
  - b. How many times do the notes repeat in the loop? (6 times)
  - c. What is the order of the notes within the loop? (Snare Drum then Hi-Hat 2)
3. Ask the students to write down or touch-type this program's code in their Computer Science Journals.
4. Ask the students to create a program according to the code they wrote down. Then, have them debug their programs, if necessary.

5. Have the students do a second exercise using a more complicated sample.
6. Alternative activity is to have students create their own program using any Sound Set, or create a custom Sound Set and create a program with a loop.

## CLOSURE

Have the students record their program in their Computer Science Journals and reflect on other situations where they could use loops.

# STANDARDS AND CHECK FOR UNDERSTANDING

## CSTA K-12 COMPUTER SCIENCE STANDARDS\*

- 1B-AP-08: Compare and refine multiple algorithms for the same task and determine which is the most appropriate.
- 1B-AP-10: Create programs that include sequences, events, loops, and conditionals.

## NATIONAL CURRICULUM OF ENGLAND\*:

### Key Stage 1:

- Understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions
- Create and debug simple programs
- Use logical reasoning to predict the behavior of simple programs
- Use technology purposefully to create, organize, store, manipulate and retrieve digital content
- Recognize common uses of information technology beyond school

- Use technology safely and respectfully, keeping personal information private; identify where to go for help and support when they have concerns about content or contact on the internet or other online technologies

### Key Stage 2:

- Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts
- Use sequence, selection, and repetition in programs; work with variables and various forms of input and output
- Use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs
- Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content
- Use technology safely, respectfully and responsibly; recognize acceptable/unacceptable behavior; identify a range of ways to report concerns about content and contact.

## CLOSING ACTIVITIES AND CHECK FOR UNDERSTANDING

- Ask the student to identify something they do that involves repetition (such as brushing their teeth or setting a table) and to write or touch-type an algorithm for it that incorporates loops.
- Ask students to think about repetitive tasks that may require multiple loops.

Check for understanding	Completed
Students can identify a task that involves repetition	Yes / No
Students can identify and break down a loop into individual steps that need to be repeated.	Yes/No

\*Computer Science Teachers Association (2017). CSTA K-12 Computer Science Standards, Revised 2017. Retrieved from <http://www.csteachers.org/standards>

\*Education, Department for. "National Curriculum in England: Computing Programmes of Study." GOV.UK, 11 Sept. 2013, [www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study](http://www.gov.uk/government/publications/national-curriculum-in-england-computing-programmes-of-study)

# CODE CARDS

## LOOPS CODE CARD: COUNTING TO THREE, LOOPED

Sample program set up and run by the teacher: Counting to Three Looped

- Sound Set: Sample Sounds: Numbers in Thread 1

THREAD 1 Numbers

LOOP 4 times

PLAY One at 1 times speed

PLAY Two at 1 times speed

PLAY Three at 1 times speed

END LOOP

END THREAD

## EXPLORATION CODE CARD: PERCUSSION

Sound Set: **Sample Sounds: Percussion** at Thread 2

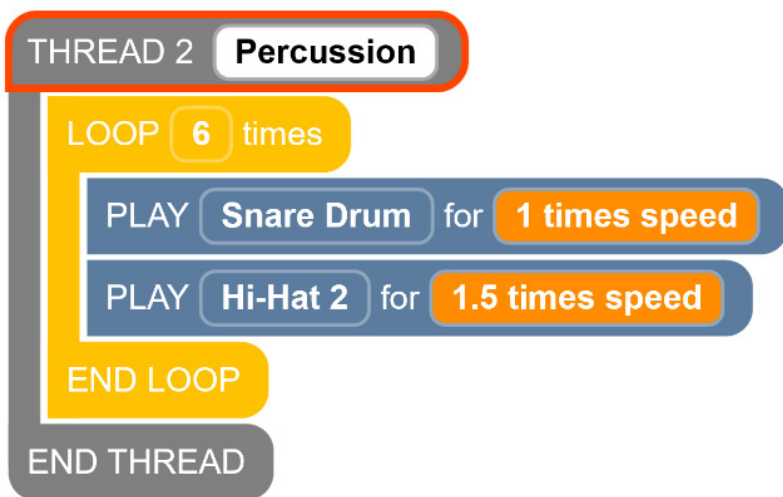
THREAD 2 Percussion

LOOP 6 times

PLAY Snare Drum for 1 times speed

PLAY Hi-Hat 2 for 1.5 times speed

END LOOP



[Figure Caption:]: This screenshot of the Code Jumper app shows a program in Thread 2. Under THREAD 2 Percussion, the commands read, LOOP 6 times, PLAY Snare Drum for 1 times speed, PLAY Hi-Hat 2 for 1.5 times speed, END LOOP; the commands are followed by END THREAD.



## EXPLORATION CODE CARD: PIANO

Sound Set: **MIDI Instruments: Piano** at Thread 3

THREAD 3 Piano

LOOP 3 times

PLAY C5 for 1/2 a beat

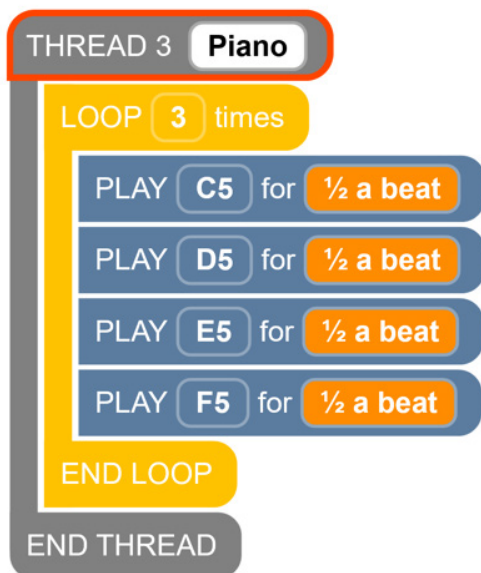
PLAY D5 for 1/2 a beat

PLAY E5 for 1/2 a beat

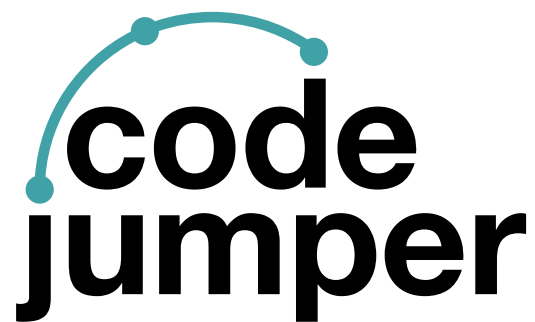
PLAY F5 for 1/2 a beat

END LOOP

END THREAD



[Figure Caption ]: This screenshot of the Code Jumper app shows a program in Thread 3. Under THREAD 3 Piano, the commands read, LOOP 3 times, PLAY C5 for 1/2 a beat, PLAY D5 for 1/2 a beat, PLAY E5 for 1/2 a beat, PLAY F5 for 1/2 a beat, END LOOP; the commands are followed by END THREAD.



For more resources, visit [codejumper.com](http://codejumper.com)

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