# Algorithms & Programming: Control  Grade Band: K-2

| Grade | Standards: AP.C.01 |
|---|---|
| K | With guidance, create a set of instructions (**programs**) to accomplish a task using a **programming language**, **device**, or **unplugged** activity, including sequencing, emphasizing the beginning, middle, and end. |
| 1 | With guidance, create programs by using creative expression or problem solving, to accomplish tasks that include sequencing and repetition. Programming languages, robot devices, or unplugged activity can serve as the means |
| 2 | Create programs using a programming language, robot device, or unplugged activity that utilize sequencing and repetition to solve a problem or express creative ideas. |

| Grade | Essential Skills |
|---|---|
| K | Recognize the order of a sequence of instructions or occurrences as the beginning, middle and end.<br><br>Create a logical sequence of instructions with guidance as needed. |
| 1 | Determine what changes will occur if there is a change in the sequence of instructions or occurrences.<br><br>Identify patterns and repetition within sequences. |
| 2 | Recognize that a **computer program** is a set of instructions in a specific sequence.<br><br>Create a simple computer program, including repeated sequences, to express an idea or solve a problem. Students can be supplied with the commands/code to create the program. |

## Explanation

Students should understand that the order of steps in a set of instructions affects the outcome or end result of the project or **program**. When instructions are repeated multiple times, loops can be used to eliminate redundancy. Students can experiment with different sequences as well as different loop configurations to determine their effect on the final outcome. Sequencing terms being used in language arts can be reinforced when addressing this standard.

## Think of this as similar to….

How might a story change if an event from the middle of a story happened when the story began?

## Essential Questions

How can you show the order of a list of steps or a set of instructions?

Why is sequence of events important in solving a problem, telling a story or writing a **computer program**?

How can you show that some or all of a list of steps or a set of instructions should be repeated?

# Implementation Examples—What would this look like in the classroom?

| Grade(s) | Title | Description | Link | Content Connection & Notes |
|---|---|---|---|---|
| K-1 | **Nevertheless, They Persevered** | **Grade K**- Students listen to the book More-Igami by Dori Kleber and then follow a sequence of origami instructions.  Students should relate their own experience following the sequence of instructions to that of Joey in the book and note how the sequence of instructions is important to the outcome. The origami patterns may be adapted as appropriate for students.<br>**Grade 1**- Students should be made aware of patterns in the instructions. they can also experiment with what happens if they follow the origami steps out of order. " | Nevertheless, They Persevered | This lesson also aligns with **ELA** RL.K.10 |
| K-1 | **Happy Maps** | **Grade K**—Students are given a maze and a character "flurb" and they work in teams to get the flurb to the fruit. Students will create precise instructions as they work to use direction arrows to help the flurb move through the maze. Students should be able to identify the beginning, middle and end of the directions that they give the flurb. If problems arise in the code, students should work together to recognize bugs and build solutions.<br>**Grade 1**-Students should experiment with changing the order of the instructions to see if the flurb still reaches the fruit. They should use patterns in the instructions to make the instructions shorter (for example instead of "turn right and go forward then turn right and go forward" students should recognize that the instruction can be "turn right and go forward twice".) | Happy Maps | This lesson also aligns with **CS** AP.V.01 and AP.PD.04; similar activities can be done with floor robots see Code and Go Introduction |
| K-2 | **Dancing Alone** | **Grade K**- Students use Scratch Jr. to create a silly dance for Scratch Cat using motion blocks. Students are introduced to creating sequences of code in Scratch Jr. Students should be able to identify the blocks at the beginning, middle and end of the program they create and in the dance the Scratch Cat does.<br>**Grade 1**- Students should identify how the order of the motion blocks determine the order of the dance, predict how changing the order of the blocks will change the dance and test their predictions. Any patterns or repeated block sequences should be identified as such.<br>**Grade 2**- Students should use at least one loop in the dance program. | Dancing Alone | This lesson also aligns with **CS** AP.V.01, AP.PD.01, AP.PD.03 and AP.PD.04 and is similar to Getting Loopy |

| Grade(s) | Title | Description | Link | Content Connection & Notes |
|---|---|---|---|---|
| 2 | **Repeated Addition** | **Grade 2 --**Students work in pairs and have each student create arrays. They then give the arrays to their partner who will use repeated addition expressed as a loop to calculate the total number of items. Students can do this as an unplugged activity, or work in Scratch Jr. | | This lesson also aligns with **MATH** 2.OA.C.4 |
| 2 | **Maze Loops** | **Grade 2**--In this Code.org Angry Birds activity students identify repeated sequences and use loops to make their code more efficient as the bird tries to catch the pig. | Maze Loops | A similar lesson is Loops with Rey and BB8 |

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These annotations are a collaboration between Maryland Center for Computing Education and the Maryland State Department of Education.