3.AP.1 Algorithms and Programming

> *The student will apply computational thinking to design algorithms to extend patterns, processes, or components of a problem. (a) Identify a pattern in an algorithm, process, or a problem. (b) Decompose a problem or task into a subset of smaller problems. (c) Design an algorithm to extend either a pattern, process, or component of a problem.*

Understanding the Standard

Computational thinking involves four components: decomposition, pattern recognition, abstraction, and algorithm design. Building on their practice of categorizing and identifying patterns in second grade, students will begin to design or debug programs by breaking down large problems into subproblems. Breaking down a large problem or task into smaller, more manageable chunks is called program decomposition. Decomposition helps in developing a program by allowing team members to focus on one part of the problem at a time or work on different parts of a program at the same time and add the smaller components together to complete a task.

Term	Definition
Algorithm	A list of steps to finish a task.
Attribute	Characteristic or physical description of an object (color, shape, size).
Pattern	A predictable, repeated sequence of objects or events.
Decompose	Breaking a complex problem into parts that are easier to understand and solve.
Subproblem	A smaller problem that is part of a larger problem.

Prerequisite Knowledge

Students will draw on experiences using flowcharts, step-by-step instructions, and delegating group responsibilities.

Integration Opportunities

Math 3.PFA.1b Students will create a step-by-step algorithm to extend an increasing or decreasing pattern, either on paper or using a block-based programming tool, by identifying the pattern's rule, applying it repeatedly to adjust terms.

English 3.FFW.2 a-c, 3.LU.2d Students use phoneme-grapheme correspondence to identify spelling patterns in high-frequency words and apply learned spelling rules to decompose and encode multisyllabic words.

Physical Education 3.1e Have students design and demonstrate a self-turn jump rope sequence with four different types of jumps. Then pair students to share and extend each other's patterns.

Music 3.12f Read and notate rhythmic patterns that include sixteenth notes, singles eighth notes, eighth rests, and dotted half notes.

VIsual Arts 3.12e Create an algorithm that creates a work of art using a decorative repeating motif.

Summary of a Lesson

As a whole group, students will review the term "decompose" and brainstorm ideas for everyday tasks that require multiple steps. Students will write each idea individually on a sticky note to create a Chalkboard Splash at the front of the room. The teacher will collect all of the ideas and have the students make groups of three. Each team will select one of the sticky note ideas from a hat and work collaboratively to decompose the larger task into smaller tasks. Teams will decide when to delegate each smaller task and create a flowchart (either using chart paper or a computer program such as Miro) from the individual contributions. Students will then peer review the steps before displaying their flowcharts in a gallery walk and explaining how diving the task can make it easier to complete.