3.AP.3 Algorithms and Programming

> *The student will use the iterative design process to create, test, and debug programs containing events, loops, and conditional structures in a block-based programming tool. (a) Create and test programs that consist of events, loops, and conditional structures. (b) Analyze and describe program results to assess validity of outcome. (c) Revise and improve programs to resolve errors or produce a desired outcome.*

Understanding the Standard

Students will review the steps in an algorithm to determine if it is working effectively as part of the iterative design process. This process of reviewing and revising is called debugging. Students will check that the algorithm is usable, complies with the program requirements, and is correctly sequenced. If the algorithm does not work as the programmer intended, students will determine what changes could be made to correct it.

Term	Definition
Sequence	An ordered set of instructions
Loop	A set of actions repeated until a condition is met
Event	Something that causes a portion of a program to run (e.g., a mouse click)
Conditional (if-statement)	A set of actions that only runs if a condition is met.
Bug	An error or flaw in a program that causes it to produce an unintended result or crash.
Debug	Find and fix problems in a program.

Prerequisite Knowledge

Students should approach this standard with some experience with composing interactive programs that include loops and events. They build on this knowledge in third grade by writing more complex programs with additional loops, events, and conditional statements.

Integration Opportunities

Science 3.4a,b Use the iterative design process to create a simulation of how populations of organisms adapt to an environment over time, using a block-based programming tool such as Scratch.

Math 3.MG.2b Use a block-based programming tool to design, test, and debug a program to calculate the perimeter of a polygon with up to six sides, incorporating events, loops, and conditional structures.

English 3.W.2a,b Have students work in pairs to compose an original narrative using a block-based programming tool. Then, they will collaborate to test, analyze, and revise their programs.

Summary of a Lesson

As a class, discuss the purpose of a conditional (if-statements). Students will create or remix a pong game via Scratch (tutorial available on Scratch). Students will incorporate at least 1 conditional (if-statement) within the program. Some possible conditionals (if-statements) students may use include: if ball touches paddle add 1 point to the score; if ball touches line beneath the paddle the game ends. Students may map out gameplay using flowcharts and use this to work collaboratively to debug any part of the algorithm that is not working as intended.