

3.AP.2 Algorithms and Programming

The student will plan and implement algorithms that consist of events and conditional control structures using a block-based programming language. (a) Describe the concept of a conditional control structure. (b) Create a design document to plan an algorithm using plain language, pseudocode, or diagrams.



Integration Opportunities

Science 3.7c Create a design document to plan an algorithm identifying the specific events of the water cycle.

Math 3.MG.4e Create a block-based program that uses conditional statements to classify polygons by the number of sides. Plan the steps in a design document and test the algorithm to ensure it accurately identifies shapes like triangles, quadrilaterals, and hexagons. Example: if the input is 3, output triangle.

English 3.W.1b Have students create a personal or fictional narrative outline to organize event sequences where the reader can choose between two options and possible outcomes.

Health 3.1r, 3.3r Have students create a flowchart to plan an algorithm for identifying and sorting waste and recyclable materials at home and school.

Understanding the Standard

Programs are collections of code organized in algorithms that can accomplish a variety of tasks (ie. perform calculations, manipulate data, or express creativity). Students will build up on their application of sequencing, events, and loops by incorporating conditional control structures into their programs. Conditionals (if-statements) are added to a program to determine whether or not to run a command, thus impacting the flow of control. For example, if the correct password is entered, unlock the computer; if the wrong password is entered don't unlock the computer. Flowcharts and decision trees are effective planning tools for these types of programs.

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.

Prerequisite Knowledge

Students should have a foundational knowledge of following step-by-step instructions and some experience with writing step-by-step instructions incorporating loops (or repeating steps) and events.

Summary of a Lesson

As a class, play a game to introduce conditionals (if-statements). Explain to students if a statement is "true" for them, they will do the action that follows (eg. If you have a blue shirt on today, then clap two times). After playing the game, explain to students that conditionals (if-statements) are used to instruct the computer to perform certain action only if a condition is met (eg. If the correct password is entered, then unlock the laptop). Break students into pairs, providing each pair with a graphic organizer of a flow chart, and a die. Each pair will construct step-by-step instructions (algorithms) incorporating conditionals for a game using a die. For example, If you roll a two, then you must walk around your chair two times. Students will then swap their flow charts with another student pair to play.