6.AP.2 Algorithms and Programming

> *The student will plan and implement algorithms that include conditional control structures and collection of numeric data using a block-based or text-based tool. (a) Create a decision tree diagram to illustrate the decision-making process. (b) Read and write programs that initialize Boolean, integer, and decimal number variables. (c) Read and write programs that collect numeric data from users. (d) Read and write programs that contain nested conditional control structures. (e) Predict the results of logic expressions that use Boolean operators: and, or, and not; including expressions that use relational expressions as one or more operands.*

Understanding the Standard

This standard asks students to read, plan, and write programs that include conditional control structures like "if" statements and "while" loops using code. "If" statements and other control structures like it involve giving the computer instructions for how to make an automated decision based on the values of one or more variables. The standard specifically says that students will need to write programs that include "Boolean operators" and "nested conditionals", which means the algorithm they design will need to direct the computer to make a decision based on two or more variables. For example, a student might write a program that collects the user's age and height, and then prints a message encouraging the user to play basketball if they are tall enough after a certain age (this is sort of a silly example intended to illustrate the point—there are a lot of ways to use conditional logic in coding).

Term	Definition
conditional	A control structure that directs the computer to either skip or execute a sequence
relational expression	An expression that evaluates to either "true" or "false"; e.g., 5 < 10 is "true", 2 > 4 is "false"
logic/Boolean expression	An expression that uses a logic operator to compare two relational expressions; e.g., "5 < 2 or 3 < 4"
variable	A named container for data in a computer program

Prerequisite Knowledge

In order to develop the skills described in this standard, students will first need to learn how to write programs that include variables, simple conditionals like "if" statements, and relational expressions (see earlier grade levels for details).

Integration Opportunities

History USII Skills g Create a decision tree diagram for economic decision making.

English 6.w.1a Use a decision tree to plot out alternate endings to a well-known story based on the reader's choices.

Science 6.7 Create a decision tree diagram to predict weather conditions.

Science 6.8d Write a program containing nested conditionals to identify various influences on the health of a watershed system.

Physical Education 6.5a Write a program to create a one-day meal and snack plan based on RDA. Use the program to input data and make decisions that help meet the recommended nutrients needed for good health.

Summary of a Lesson

Have students plan an algorithm for a coding project that includes using an "if" statement that directs the computer to display a particular message based on two conditions. Those conditions will be represented by relational expressions joined by a logical operator (e.g., in the context of a game, a particular sprite is overlapping

another one *and* the player's score is below 5, then the computer says "you lose" and ends the game). There are many ways to accomplish this, so refer to your chosen coding tool for details.