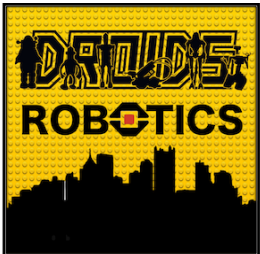


# ADVANCED EV3 PROGRAMMING LESSON



## Arrays

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By Droids Robotics

# Lesson Objectives



- Build upon skills from the Variables lesson in Intermediate
- Learn how to read/write to arrays
- Learn about the Array Operations block
- Learn to use the loop count in a loop
  
- Prerequisites: Data Wires, Loops, Variables

# Why Use Arrays?



1. Simplify programs by storing multiple related values in a single variable
2. Can be used with loops to make compact and useful programs
3. Are useful for making a custom calibration program (see NXT Light Sensor in EV3 on our contributed lessons tab)

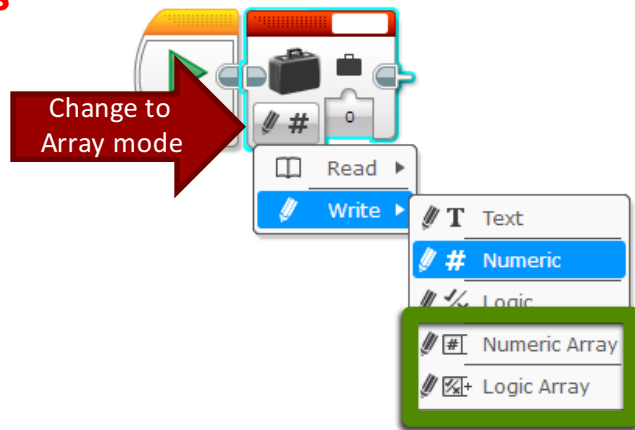
# Arrays



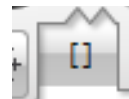
- What is an array?
  - An array is a variable that holds multiple values
- There are two types of arrays:
  - Numeric Array (Holds a set of numbers ... 1,2,3,10,55)
  - Logic Array (Holds a set of logic ... True, True, False)
- They can be used as either Inputs or Outputs so you can either....
  - Write – put a value(s) into the array
  - Read – get the value(s) from the array out

# Array Blocks: Quick Guide

## Modes



Logic Array



Numeric Array

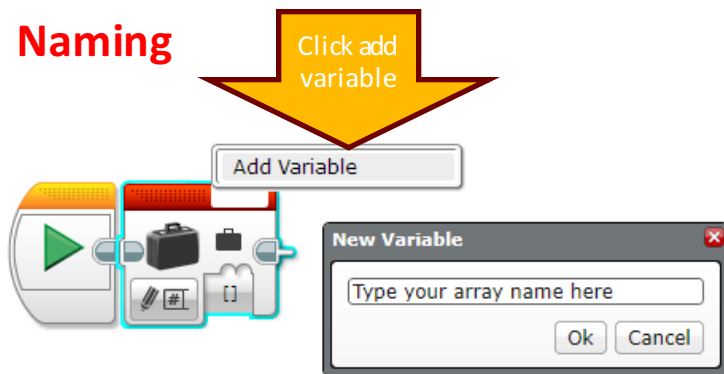


Write (Inputs) have 2 bumps up



Read (Outputs) have 2 bumps down

## Naming



Read logic array

Write logic array

Read numeric array

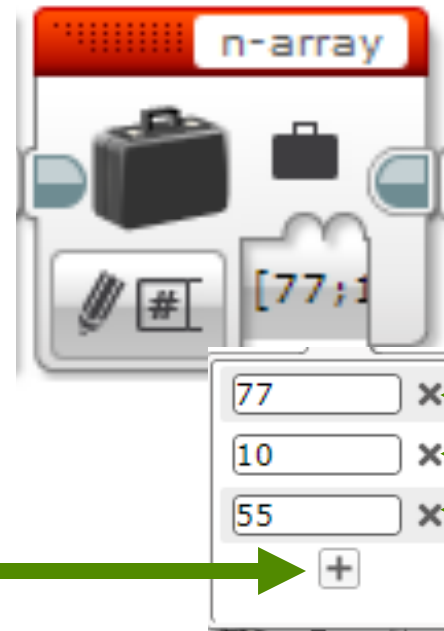
Write numeric array

## Quiz

Identify if the variables are Inputs/Outputs and if they are Numeric/ Logic

# Array Indexes

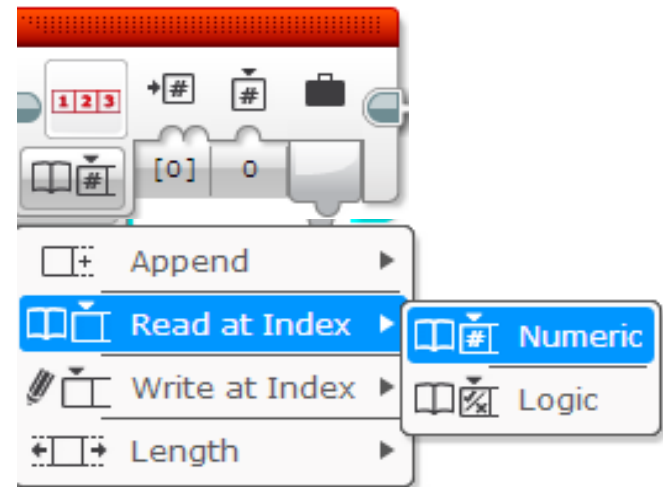
- Each value in an array is assigned an index
- The first value would be at index 0
- Logic arrays would store True/False instead of numbers
- To add a value to an array click the plus +
  - This adds an entry at the next index value (i.e. index 3)



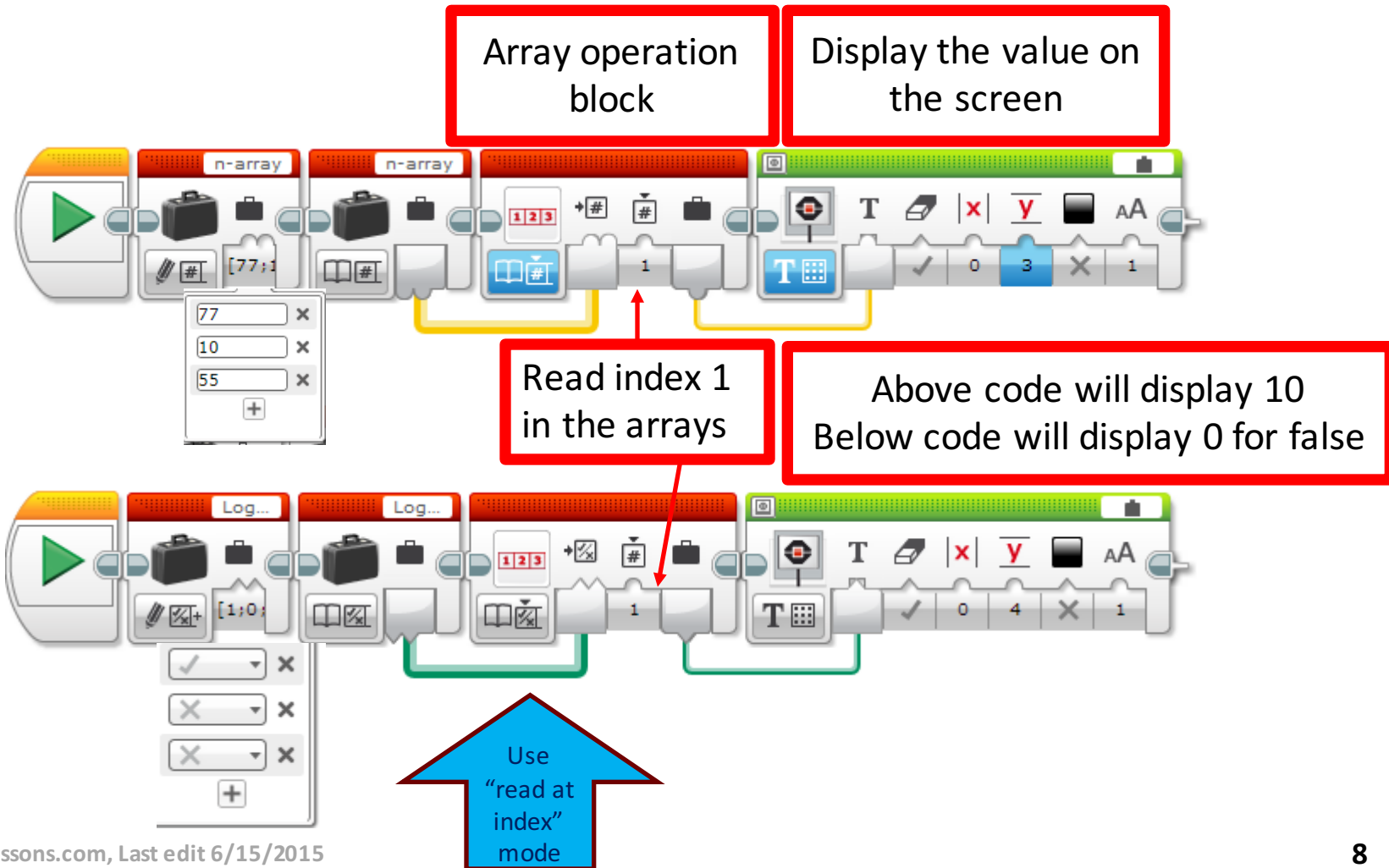
These are  
values for  
index 0,1,2

# Block: Array Operations

- This block is used to read or write to Logic or Numeric arrays
- Different modes:
  - Append: Add a new entry after the last array index
  - Read at index: Reads the value at a certain index
  - Write at Index: Write a new value to a certain array index
  - Length: How many entries are in the array
- Both write and append output an array → you will need to write this array back to the variable if you wish to update the stored array (see write/append slides)



# How do you use Arrays (Reading)?





# How do you use Arrays (Writing)?

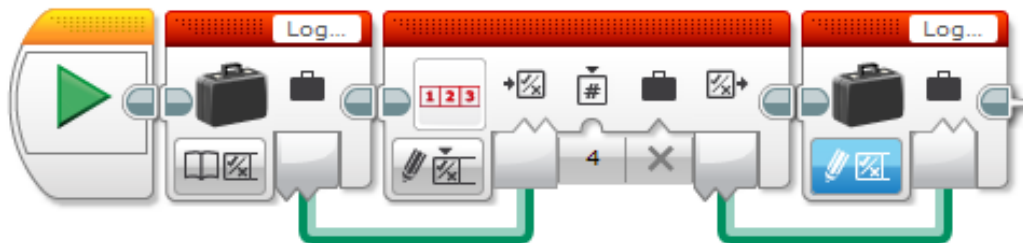


This will write 700 to array at index 4

Read the array you want to write to

Use array operations to write a value to a certain index

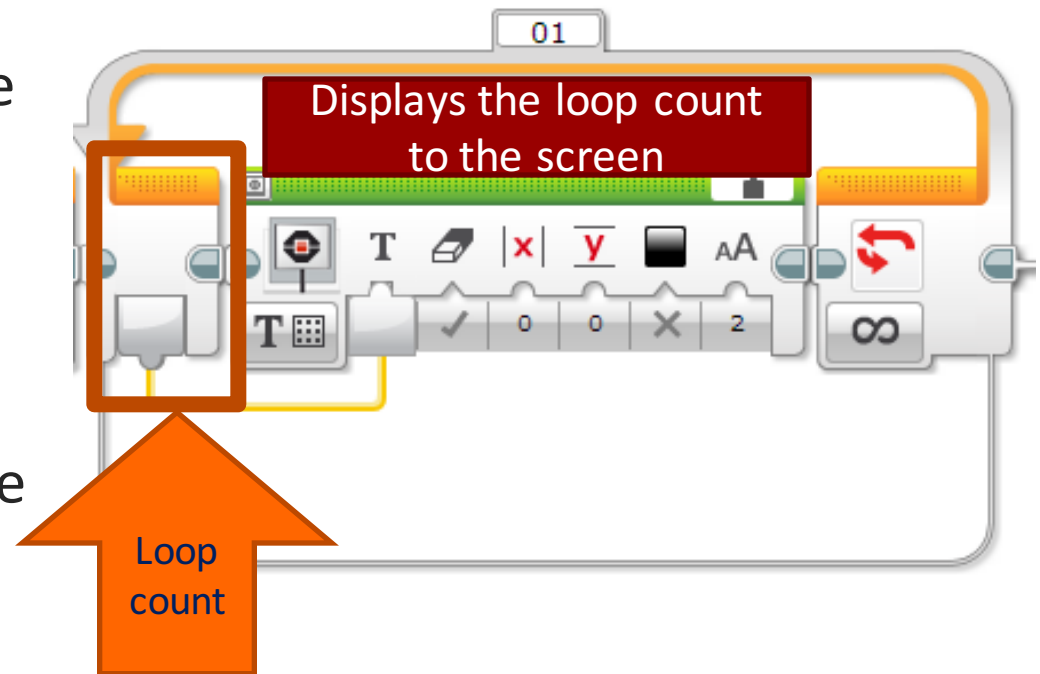
Write the output back to the array



This will write False to array at index 4

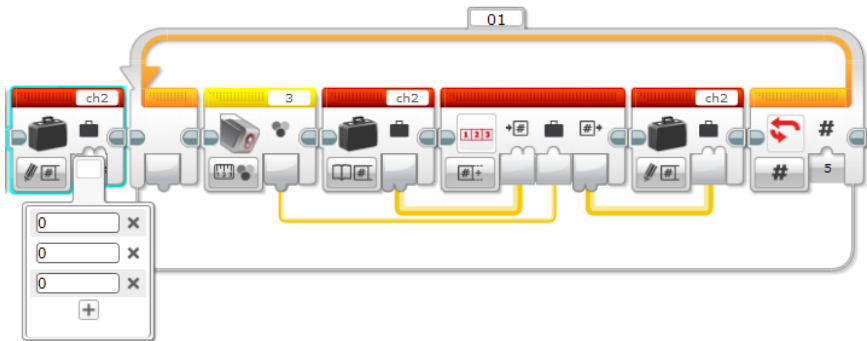
# Block Setting: Loop Count

- The loop count outputs the amount of times the blocks inside the loop have played.
- This is useful to create a program that runs different code every time it goes in the loop
- It is also useful for computing on each item of an array



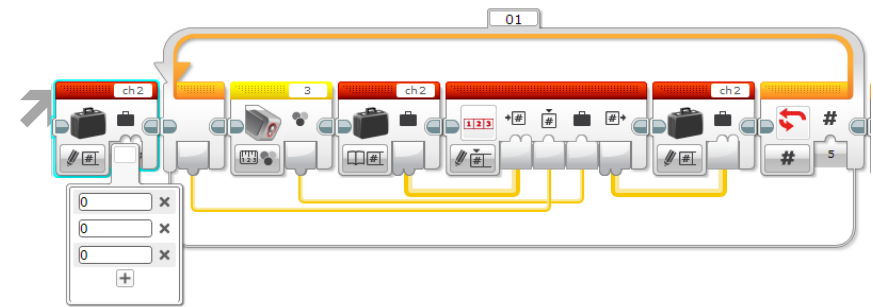
# Note: Append vs. Write

- Append adds entries to the end of an array (i.e. creates a new index value)



- This code produces an array with 8 entries (three 0's followed by 5 light readings)

- Write overwrites the entry at the chosen index



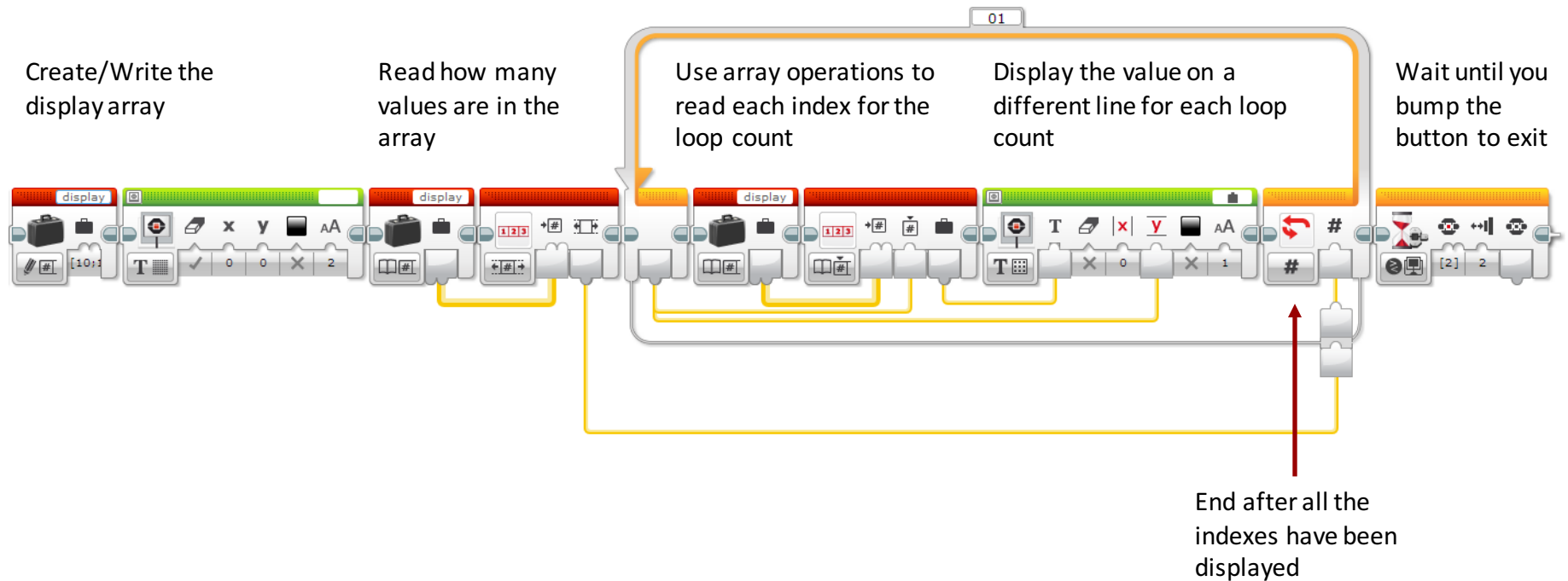
- This code produces an array with 5 entries (just 5 light readings)

# Challenge 1



- Make a program that displays all the entries of an array. Display each index on a different line. You can use only one display block.
- Tips: You will need to use loops, loop count, array block, array operations

# Challenge 1 Solution

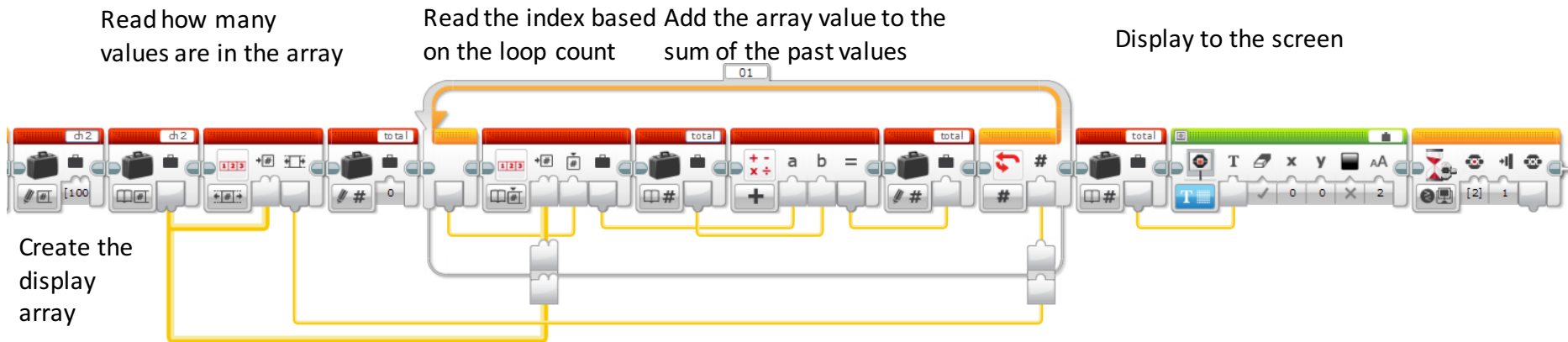


# Challenge 2



- Make a program that adds up all the entries of an array. Display the sum.
- Tips: You will need to use loops, loop count, array block, array operations

# Challenge 2 Solution



# Next Steps



➤ Here are some fun things to try:

1. Make a program to compute the average value in an array
2. Make a program that always saves the last 4 light sensor readings in an array
3. Create an array that stores calibration values for each sensor port



# Credits

- This tutorial was written by Sanjay Seshan and Arvind Seshan from Droids Robotics
- More lessons at [www.ev3lessons.com](http://www.ev3lessons.com)



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