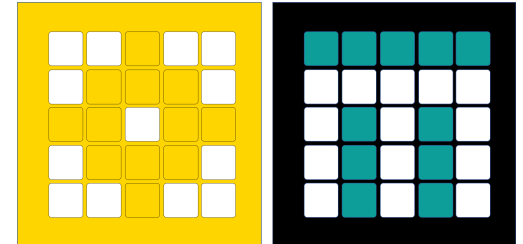


PRIME LESSONS

By the Makers of EV3Lessons



VARIABLES

BY SANJAY AND ARVIND SESHAN

LESSON OBJECTIVES

1. Learn about different types of variables
2. Learn how to read and write to variables

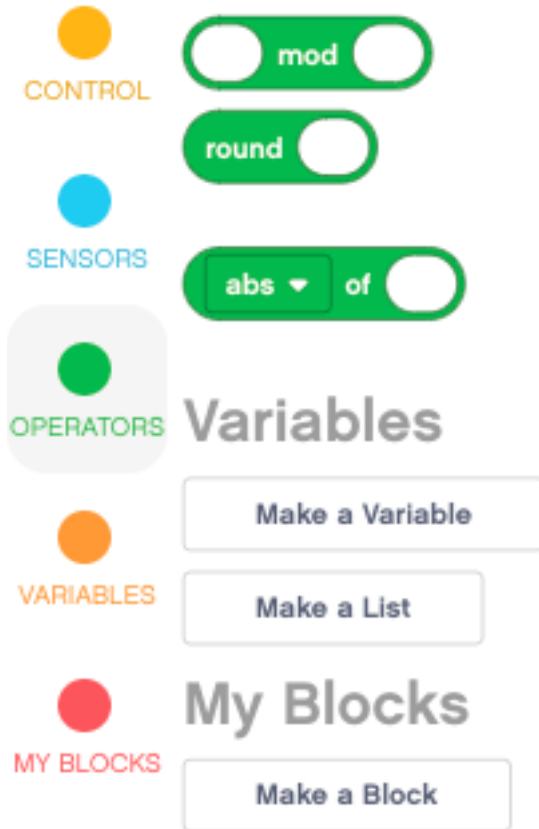
VARIABLES

- What is a variable? Ans. A variable stores a value that you can use later in your program. Think of it like a notepad or a box that holds a value for you.
- You can name the variable whatever you want
- You can define the type of variable:
 - Variable (Holds a number or text) → Note: there are no Boolean/logic variables
 - List (Holds a set of numbers/text ... [1,2,3, apple, 55]) – these are covered in the lesson on Lists
- You can either....
 - Write – put a value into the variable
 - Read – retrieve the last value written to the variable

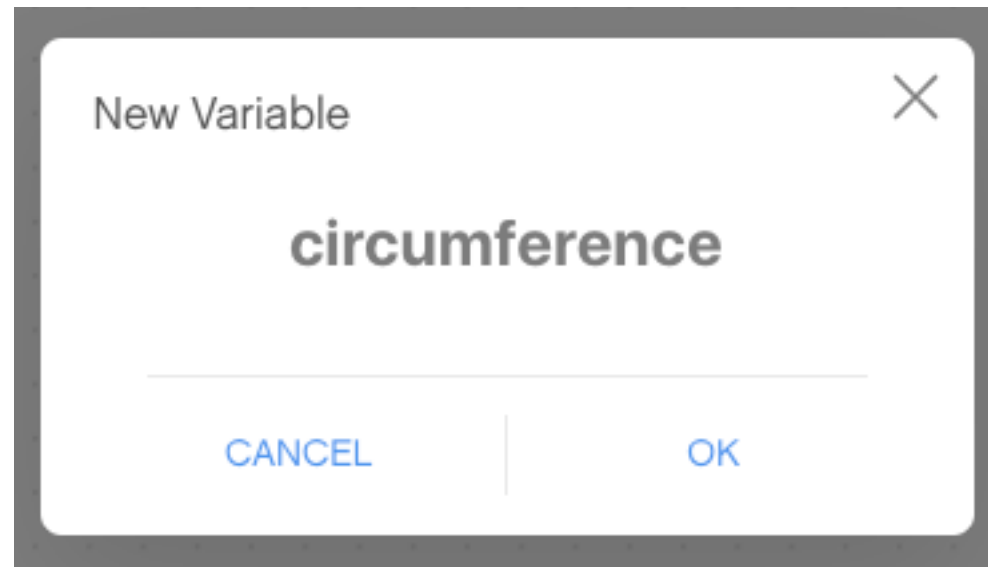
WHY VARIABLES?

- Variables are an easy way to transfer data across code
- You can also use variables to transfer data into a My Block without an input (eg. A variable for wheel size in Move Inches – You probably do not want this to be an input since it rarely changes. You may also use the value in other locations and want to change it just in one spot.)
- List variables can store multiple data items and make it easy to process all of them. We will cover list variables in a separate lesson in the advanced section.

CREATING A VARIABLE



- To create a variable, scroll down to the Variables section
- Select Make a Variable and Name it.
- In the example below, a variable called “circumference” has been made



WRITING TO A VARIABLE

- Once you have created the variable, it will appear in the menu bar.

Variables

Make a Variable

circumference

set circumference to 0

change circumference by 1

Make a List

My Blocks

Make a Block

In the example below, Circumference is set to the circumference of the EV3 Educator robot wheel in centimeters.

Circumference = Pi X Wheel Diameter

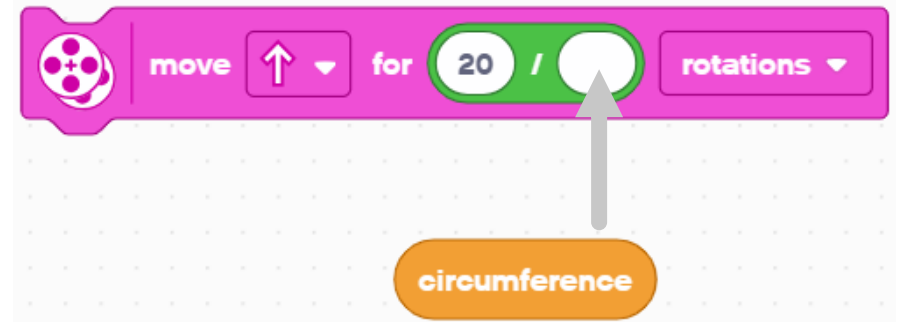
Circumference = 3.14 X 5.6

This can be calculated using a Math Block

set circumference to 3.14 * 5.6

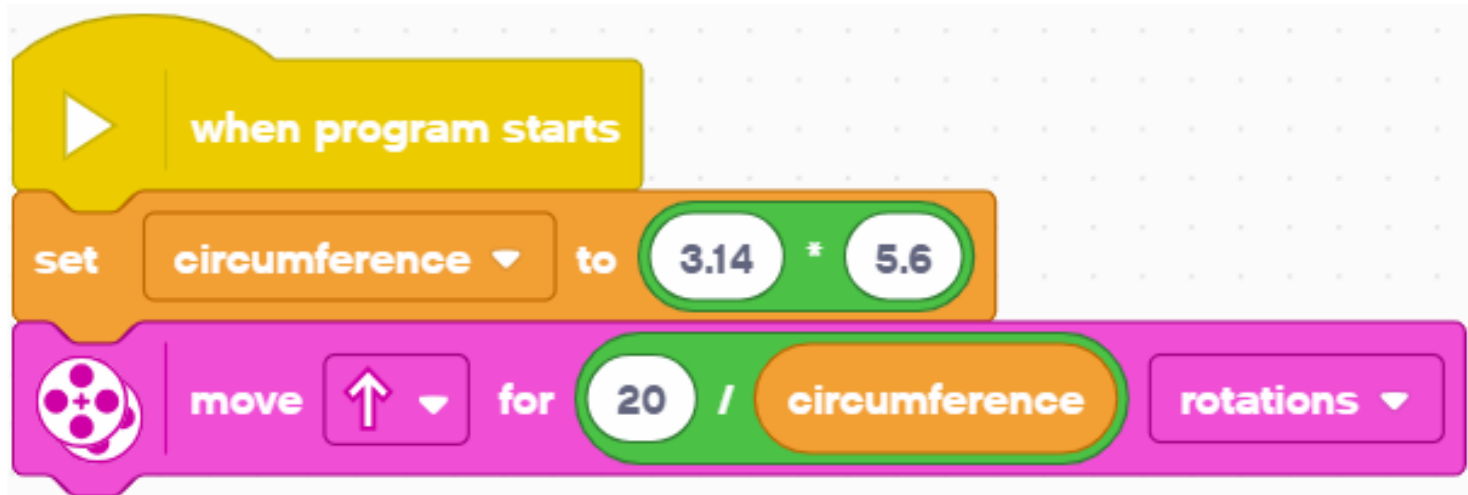
READING A VARIABLE

- The variable can now be used in any block with an oval shape operator where you would normally type in a value
- In the example on the right, the circumference is used to move the robot forward 20 centimeters (20 CM/Centimeters in a Circumference)
- For example, if the circumference was 10CM, the robot would have to move 2 rotations to move 20CM.



PUTTING IT ALL TOGETHER

- In this example, the program moves 20CM
- First set the variable “circumference” before using it in the program
- Use the variable in the movement block



CHANGING VARIABLES

- Once you have created the variable, it will appear in the menu bar.

Variables

Make a Variable

circumference

set circumference to 0

change circumference by 1

Make a List

My Blocks

Make a Block

In the example below, counter is initialized to 1. The change by 2 will add 2 to the counter.

The display block will show a 3 on the screen since $1 + 2 = 3$

Note that you can change by a negative number as well – this will subtract from the variable.



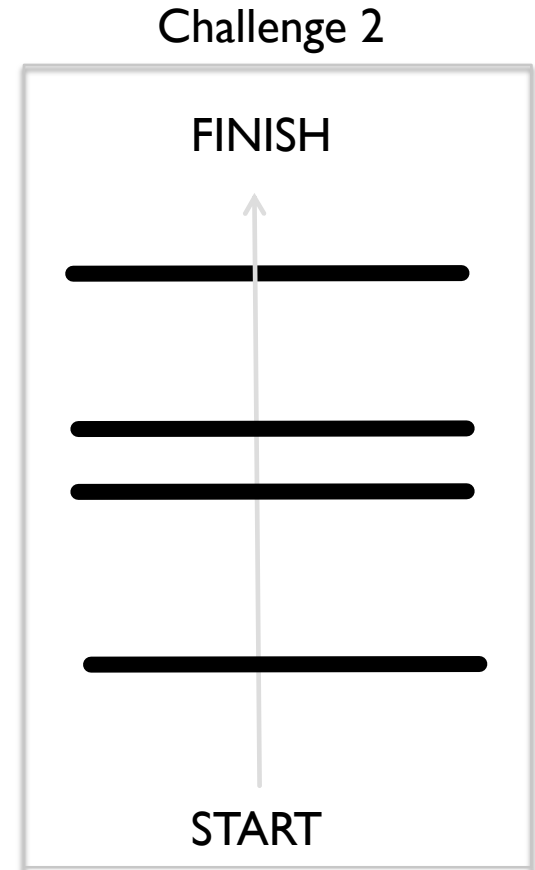
CHALLENGES

■ Challenge 1:

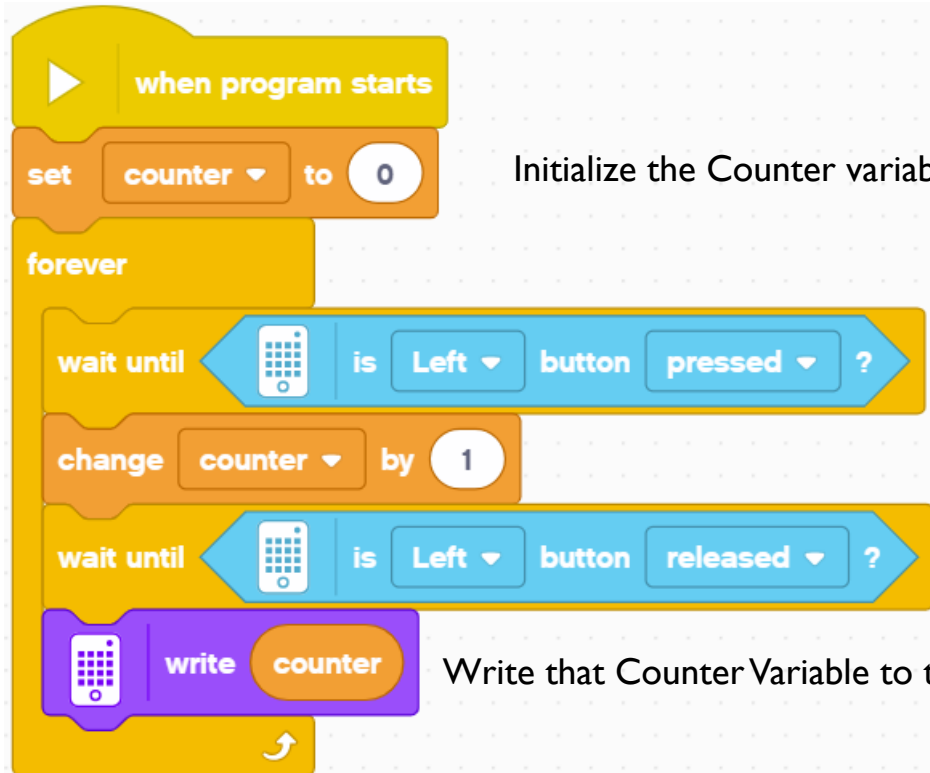
- Can you make a program that displays the number of times that you have pressed the left button?

■ Challenge 2:

- Can you write a program that counts the number of black lines you have crossed?



SOLUTION: COUNT CLICKS




Initialize the Counter variable to 0

Every time the Left button is pressed, increase the Counter variable by one

Wait until the button is released otherwise it will go through the loop multiple times each time you press the button

Write that Counter Variable to the screen to display

SOLUTION: COUNT THE LINES



The image shows a Scratch script for counting lines. It starts with a 'when program starts' block, followed by 'set counter to 0', 'set movement motors to A+E', and 'start moving straight: 0'. A 'forever' loop contains three blocks: 'wait until B is color black?', 'change counter by 1', and 'wait until B is color white?'. The script ends with a 'write counter' block.

when program starts

set counter to 0 Initialize the Counter variable to 0

set movement motors to A+E Set movement motors

start moving straight: 0 Start moving the robot

forever

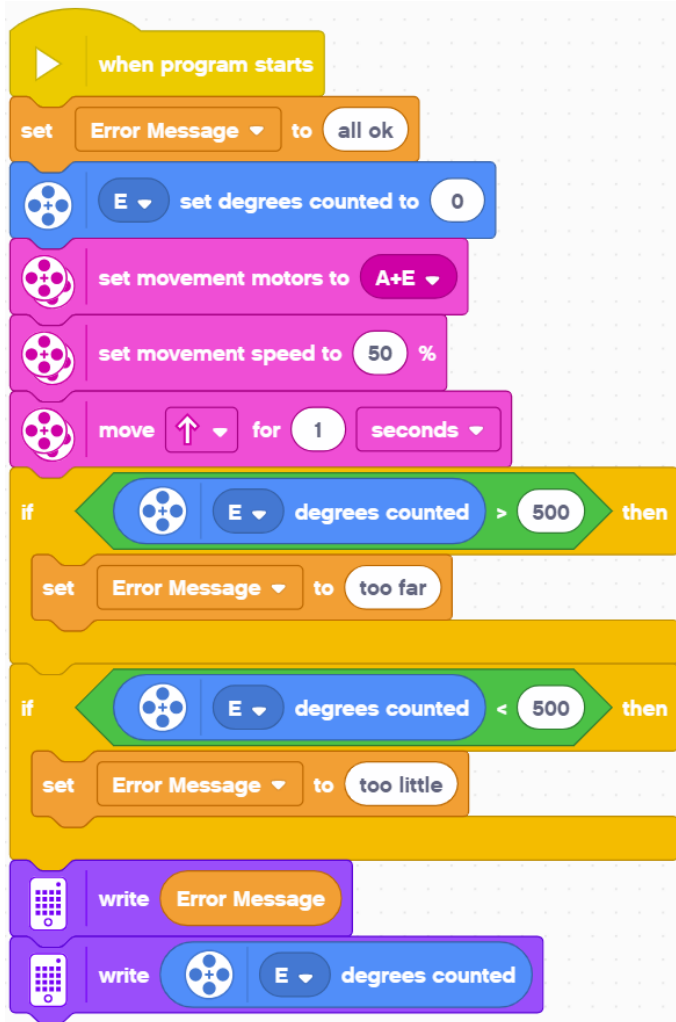
wait until B is color black? Every time a black line is seen, increase the Counter variable by one

change counter by 1

wait until B is color white? Wait until the sensor sees white, otherwise you will count the same black line multiple times.

write counter Write that Counter Variable to the screen to display

NON-NUMERIC VARIABLES



- Variables can also store text
- In the example on the left, we use the “Error Message” variable to store text that describes what went wrong
- The program lets the user know if the robot travelled too far or too little if the goal was to move 500 degrees.
- Note: 1 sec at 50 % speed should move 500 degrees

CREDITS

- This lesson was created by Sanjay Seshan and Arvind Seshan for Prime Lessons
- More lessons are available at www.primelessons.org



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