# Creating Custom Blocks with The Creative Toolbox

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About the Authors

Sanjay and Arvind, or the Seshan Brothers, are well-known in the LEGO® robotics community. They are the founders of EV3Lessons.com, a highly popular site to learn to program with MINDSTORMS, and they are also the winners of the prestigious FIRST LEGO® League World Festival Champion's Award. They love to play with all LEGO® robotics platforms, and enjoy teaching programming and sharing their creations with others.

Introduction

LEGO® Boost has a great many possibilities for coding. You can start with the built-in models and their programs. However, the Creative Canvas section of the App allows you to explore further and make highly sophisticated programs.
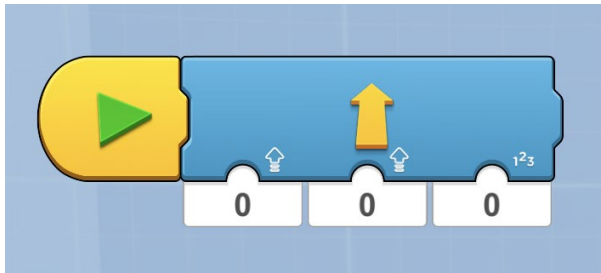
Lesson Objective

Boost lets you learn many programming concepts while having fun with the built-in models. In this lesson, you use Vernie to explore additional coding concepts. You will program Vernie to move a particular distance of your choice that you will measure in centimeters. You will create a custom block for Vernie that will allow you to enter both the speed and distance that you want Vernie to move. You will be programming using the Creative Canvas area of the App.

Robot Design

Follow the building instructions in the Boost App to construct Vernie. No modifications will need to be made. However, you will need a centimeter ruler or meter stick for the next part of the tutorial.

Converting Centimeters to Motor Degrees

The first step in creating the custom block is to calculate how many motor degrees Vernie moves for every centimeter. Place Vernie along a meter stick or centimeter ruler on the floor.

Step 1: Drag in a *Start Block* Drag in a *Button Widget Show Block* so that the button will be shown to the user Drag in a Set *Motor Rotation Sensor Block* and set it to 0 to reset the rotation sensor	

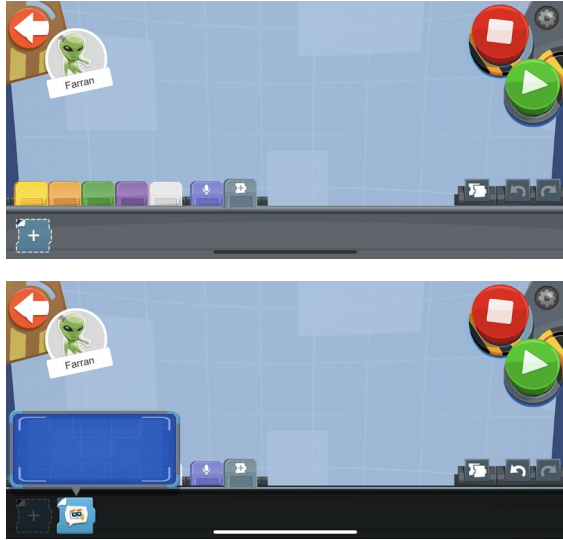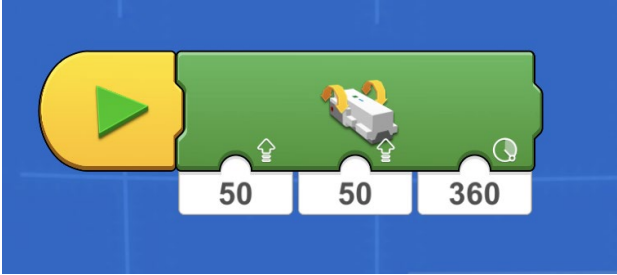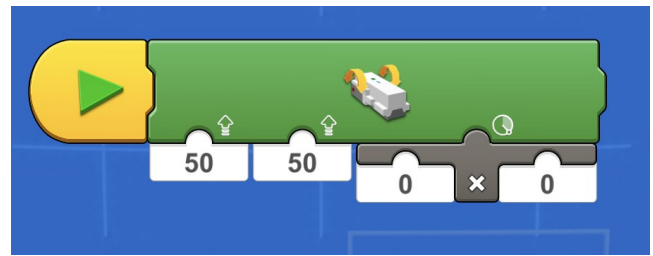|	
Step 2: Add a *Forever Loop* so the program will continuously display the rotation sensor	
Step 3: Add an *If/Else Switch* inside the Loop Add a *Button Widget Reporter* to the Switch statement	
Step 4: Add a *Stop All Sequences* to the True statement of the Switch so that the program will end when the button is pressed Add a *Display Widget Show Block* to the False statement of the Switch and a *Drivebase Position Reporter Block* under the Display Widget Show Block in the False statement so that the rotation sensor data is displayed when the button is not pressed	
Step 5: Measure the Degrees Run the program you created. Now, move Vernie manually along the ruler for as much distance as you want (e.g. 30 cm). Place your hands firmly on the treads and move them forward to get a correct measurement.	 Watch the display on your screen. You will see the number of degrees displayed.
Step 6: Degrees per cm. Calculation Take the number of degrees displayed on the screen and divide by 30 centimeters to get the number of degrees Vernie moves for each centimeter. Write down this value.	You will use this calculation later in Step 6 of the Programming Steps section of this tutorial below.
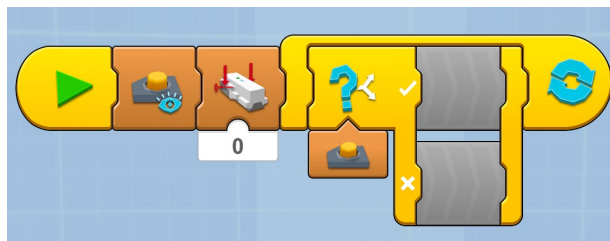
Programming Steps

Go to the Creative Canvas Area of the Boost App.

Step 1: Starting a Custom Block Click on the Grey Custom Block pallet. Click on the plus sign to create a new block. Click on the Dark Blue rectangle to go inside the custom block	
Step 2: Customizing the Icon Click on the auto-generated icon to change it. Select the yellow forward arrow.	
Step 3: Creating the Custom Block Drag in a *Start Block* from the Yellow Palette Drag in a *Drivebase Move Tank for Distance Block*	

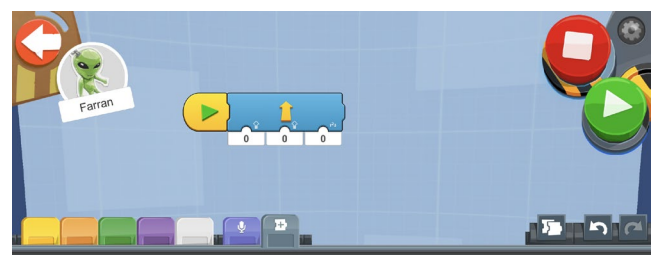|	
Step 4: From the *White Math Pallet*, select the *Multiply Operator*. Drag this into the last parameter in the *Move Tank for Distance Block*.	
Step 5: Go back to the Custom Blocks Grey Pallet and drag in three variables. Variables 1 and 2 are for the speed of Motors A and B. Variable 3 will be for the number of centimeters.	
Step 6: Enter the number of degrees that Vernie moves per centimeter in the last remaining parameter. You calculated this in the **Converting Centimeters to Motor Degrees** section above.	
Step 7: Hit the back arrow to exit the custom block. **Step 8:** Now you are ready to program Vernie to move a particular number of centimeters and at a particular speed. You can find your new block with the Yellow Arrow icon in the Grey Custom Blocks Pallet. Use your new block to program Vernie to move at whatever speed you want and for whatever distance you want. (e.g. try '50' for Motor A and B Speeds and '30' for Distance and see what happens.	

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