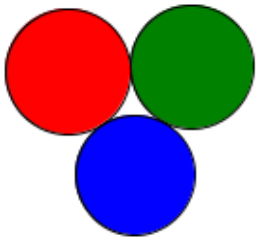
Unit 1: Getting Started with TI-Innovator™ Hub | **Skill Builder 2: Input and Color**

In this second lesson for Unit 1, you will learn about input to a program and controlling the COLOR LED on the TI-Innovator™ Hub.

Objectives:

- Use arguments to a program
- Control the COLOR LED



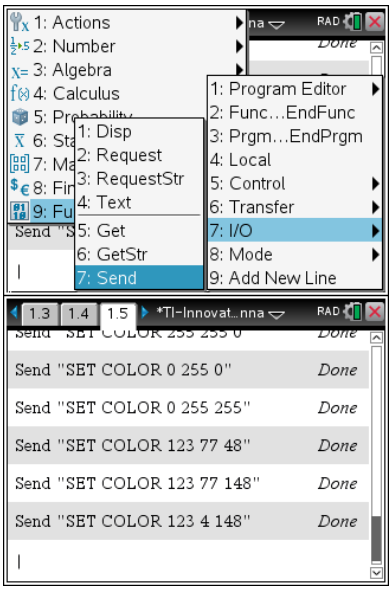
The COLOR LED (light emitting diode) has three color 'channels': red, green, and blue. This is often referred to as a "RGB LED". Computer screens, phone screens and TV screens all use a large number of these LEDs to create images.

To get a particular color, you have to mix the right amounts of the three colors red, green, and blue. Many other colors are possible with the right mix of these three primary colors.

First, let's control the COLOR LED from the Calculator app:

1. Add a Calculator app page.
2. Press **menu > Functions & Programs > I/O**, and select the **Send** command.

Note that many of the programming commands are available and can be used in the Calculator app. You can test TI-Innovator Hub commands without writing a program.



3. After the keyword **Send,** type both leading and trailing quotation marks with one step by pressing ctrl [×].
4. Inside the quotation marks, type:

   SET COLOR (Note: It is case sensitive.)

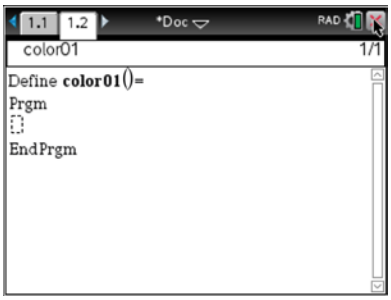
5. Enter three numeric values separated by spaces. These numbers represent the amount of red, green, and blue light to be produced.
   - Each of the three numbers must be between 0 and 255, inclusive. The higher the number, the brighter the color. See the examples to the right. The first number is the amount of RED, then GREEN, and then BLUE light to produce.

Note that the LED stays on until it is changed. A program can help control the LED more precisely by turning it off before the program ends.

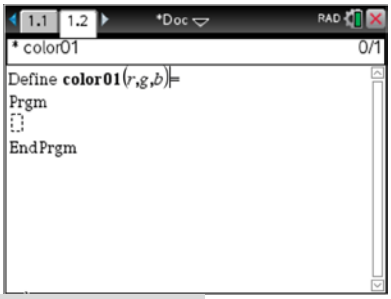
In the program, you will experiment with the COLOR LED. You will provide red, green, and blue values as *arguments*. The LED will light up in the color that you chose for a few seconds and then turn off the LED.

Setting up the COLOR Program

1. Add a new page by pressing ctrl+doc, or start a new document. Select **Program Editor** from the menu.
2. Name the program color01.



3. Inside the parentheses after the program name, type three letters separated by commas to represent the colors red, green, and blue.
   - These are called 'arguments' to the program and will be used by the program to send the three color values to the TI-Innovator Hub.
   - We used the letters **r,g,b** on the right.

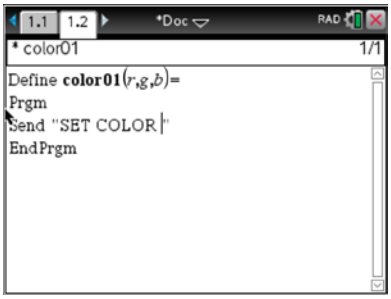


Teacher Tip: Arguments are one way of providing information to a program. The other way is to use **Request** statements which are introduced in a later lesson. The arguments used in the Program Editor are called 'formal arguments' and are treated as local variables. The values (the 'actual arguments') will be entered when the program is run.

Arguments are 'placeholders' for values that you will provide when you run the program. They are variables that the program uses to represent your actual values. These variables exist only for the program and are not available to other apps and so are treated as 'local variables'.

Teacher Tip: The COLOR LED can be set in two different ways. You can either send values for all three colors in one statement ("SET COLOR # # #") or use separate Send statements to control each color channel, COLOR.RED, COLOR.GREEN, and COLOR.BLUE. In either case, the permitted color values are in the range 0…255. Therefore, the total number of colors possible is 256^3=16777216.

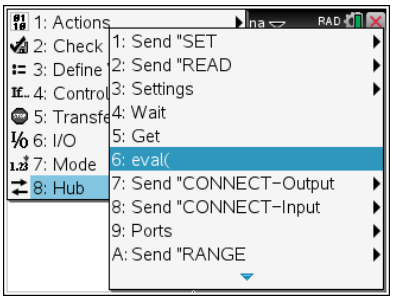
4. Select **menu > Hub > Send "SET…> COLOR** to paste the first part of the command into the program.



Understanding eval( )

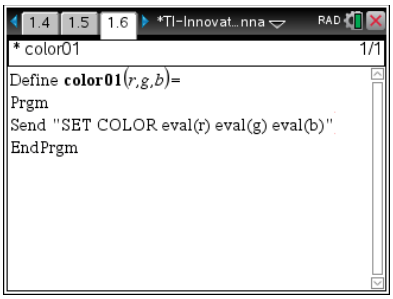
You cannot send the variables *r, g,* and *b* as the color values in the **Send** statement because the *letters r*, *g,* and b would be sent to the TI-Innovator Hub rather than the *values* of the variables.

We need to use a special function, **eval( )**, from the Hub menu which is designed to convert the value of an expression in the handheld into a string representation that the TI-Innovator Hub can process.

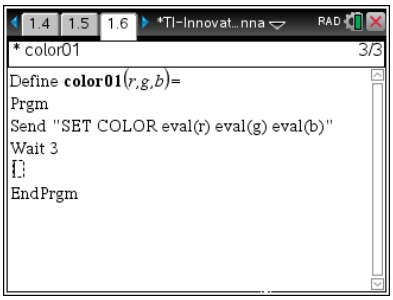


Complete the Send Statement

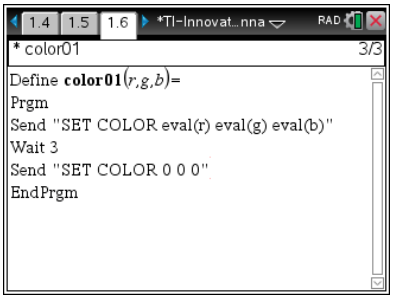
1. Add the **eval( )** function by selecting **menu > Hub** > **eval(**.
2. Type the letter *r* inside the parentheses.
3. Add a space after the parentheses.
4. Repeat the **eval( )** function two more times for *g* and *b*. Don't forget to add a space in between each. The **Send** statement should look like the screen to the right.



5. After the **Send** statement, add a **Wait** statement to wait a few seconds. Remember to provide a number of seconds.



6. Finally, add another **Send "SET COLOR** … statement to turn the color LED off.
   - Use three 0s to turn off all three colors.



Running the Program

1. Be sure that the TI-Innovator Hub is connected.
2. Press **ctrl+R** to check, store, and run the program.
3. In the Calculator app, inside the parentheses, provide three numbers separated by commas representing the amount of red, green, and blue light to mix. Then, press **enter**.
   - The color LED lights up for the number of seconds you specified in the Wait statement and then turns off.

Note: To run the program again with different values, press the up arrow twice to highlight the program name, press **enter**, and then edit the numbers before pressing **enter** again.

Teacher Tip: Try sending the values 1 1 1, and look closely to see that the LED actually consists of three tiny lights that are very close together. Diffusion of the LED helps to blend the colors better. Cover the LED with a piece of white paper to better 'mix' the three colors. Especially interesting is using the values 255 255 0 (red and green) to get YELLOW. Challenge students to make orange.
Once it is set, it remains on and displays the color until the TI-Innovator Hub is unplugged from the handheld or a different SET COLOR command is used. Sending the values 0 0 0 to the COLOR LED will turn it off.