

## Random Colors

Time required: 30 minutes

Please read all the directions carefully before beginning the assignment.

- Comment your code as shown in the tutorials and other code examples.
- Follow all directions carefully and accurately.
- Think of the directions as minimum requirements.

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### Description

This program shows how to use random numbers to control the LED's on the mBot. Randomization makes programs much more interesting. Randomization is part of game programming. You don't want the game to behave the same way each time you play it.

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### Understanding

Demonstrate understanding of:

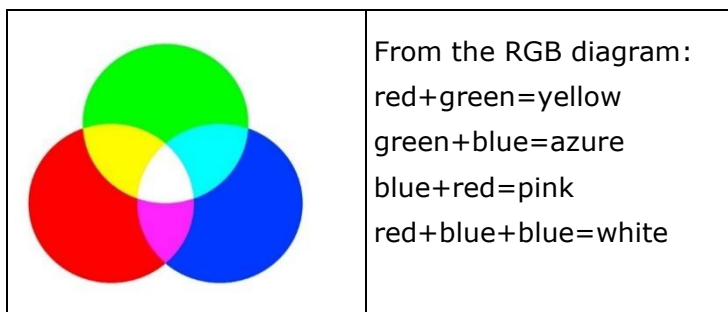
**RGB colors, LED's, Random Numbers**

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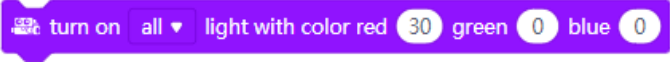
### Knowledge Points

#### Principles of Color and Light Mixing










Each of the onboard LED's are 3 LED's: Red, Green, and Blue, put together in one package. The color of the onboard LED uses the RGB color model. It is a color-adding model, which shows a variety of colors effects by mixing two or three colors in different ratios.



## Color and Light of the Onboard LED

The color and light values of the onboard LED's use the RGB color map. The larger the value in  is, the brighter the light is, and mixed color is brighter than a single color.

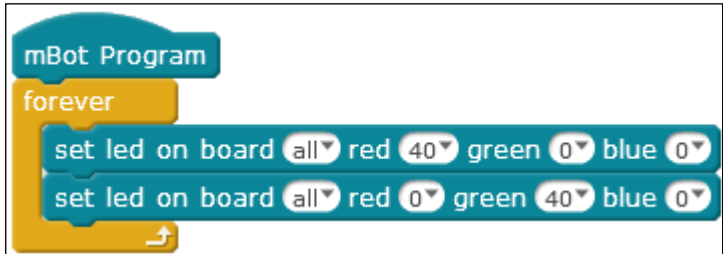

You can use the RGB color table to set the onboard LED color. The onboard LED color is seen more easily when the value is below 40. Divide the RGB value (the 3rd column in the following table) by 10 and round it to determine the on-board LED value (the 4th column in the following table). This keeps the colors proportional.

RGB real color	Name	R.G.B value	Onboard LED value	Block setting
	Cyan4	0 139 139	0 14 14	set led on board all▼ red 0▼ green 14▼ blue 14▼
	DodgerBlue	30 144 255	3 14 26	set led on board all▼ red 3▼ green 14▼ blue 26▼
	SpringGreen2	0 238 118	0 24 12	set led on board all▼ red 1▼ green 24▼ blue 12▼
	Firebrick	178 34 34	18 3 3	set led on board all▼ red 18▼ green 3▼ blue 3▼
	VioletRed	208 32 144	21 3 14	set led on board all▼ red 21▼ green 3▼ blue 14▼
	Maroon	176 48 96	18 5 10	set led on board all▼ red 18▼ green 5▼ blue 10▼
	DarkGoldenrod4	139 101 8	14 10 1	set led on board all▼ red 14▼ green 10▼ blue 1▼
	Cougar Blue	0 58 112	0 6 11	set led on board all▼ red 0▼ green 6▼ blue 11▼
	Cougar Gold	249 190 0	25 19 0	set led on board all▼ red 249▼ green 190▼ blue 0▼

## What if You Execute Two LED Blocks of Different Colors?

The mBot runs programs very rapidly, there isn't any "waiting" between "red light" and "blue light". It is the same as lighting red and blue at the same time, you will see yellow. The following two programs show yellow when they are executed. The wait block is needed for a pause between color changes.


Code	Effect
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	<p>The onboard LED will continually display yellow with either version of the program.</p>
	

## Random Number Block

The random number block generates a random number each time the program is executed. For example, the result of rolling a dice can be considered random since the outcome is inclusive between integer 1-6.

### 1. Define the inclusive range of the random number.

- Define the two inclusive ends of the range of the random number. The range can start from a smaller number to a larger number, or vice versa.
- Double-click to enter the range directly. A decimal or negative number is also acceptable. 

- Random integer and random decimal.** When both numbers are integers (whole numbers), an integer will be selected randomly. If there's a decimal in at least one number, a random decimal will be generated. For example,  will generate a random decimal.

In this assignment, random numbers are selected as the values of the three primary colors, red, green, and blue. In this way, red, green, and blue colors are combined randomly, producing a random color for the LED light.

**NOTE:** LEDs do not accept decimals as brightness. Use integers (whole numbers).

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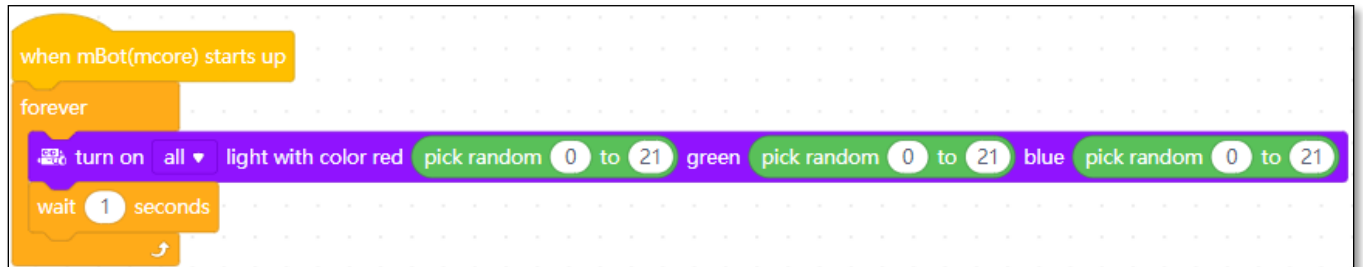
## Requirements

The onboard LED lights change randomly every second.

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## Tutorial

1. Start mBlock. Save the program as **Random Colors**.
2. Create and test the program as shown.



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## Assignment

Start with your tutorial project and add the following.

1. Change the left and right LEDs on board to show different random colors.
2. Choose a random value for one or two colors, set the others to a static value.
3. Change the range of the random numbers.

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## Assignment Submission

- **All students** → Attach finished programs to the assignment in Blackboard.
- **In class assignment submission** → Demonstrate in person.
- **Online submission** → A link to a YouTube video recording showing the assignment placed in the submission area in BlackBoard.