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| **Colored Images** |

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| **Your Tasks** |
| * Assign group roles * Get introduced to how computers store colors * Get Acquainted with the pixelation widget * Sample an analog image * Create a logo using the pixelation widget * Complete the reflection * Receive credit for this lab guide |

* **Assign group roles**

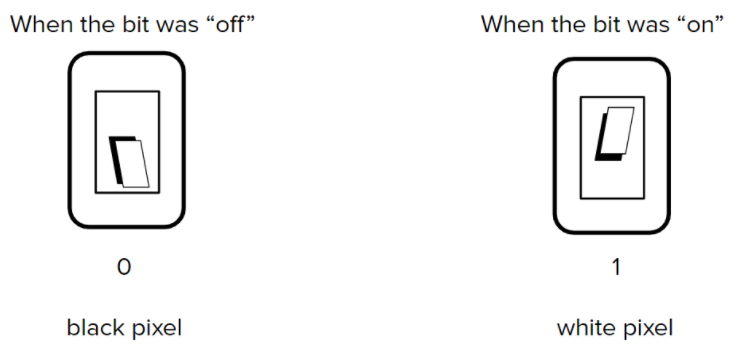
Before you continue. record your group number, then collaborate with your group and assign each person a role. Each role and a description is provided below.

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| **Project manager (PM)** | Leads the team discussion and keeps the team on task and on schedule. Make sure the final lab is submitted.  Considers how the team is working and ensures all voices are hear. |
| **Recorder (R)** | Records answers for the team, or ensures that all members have correct answers.  Presents answers (or questions) to the class, instructor or other teams. |

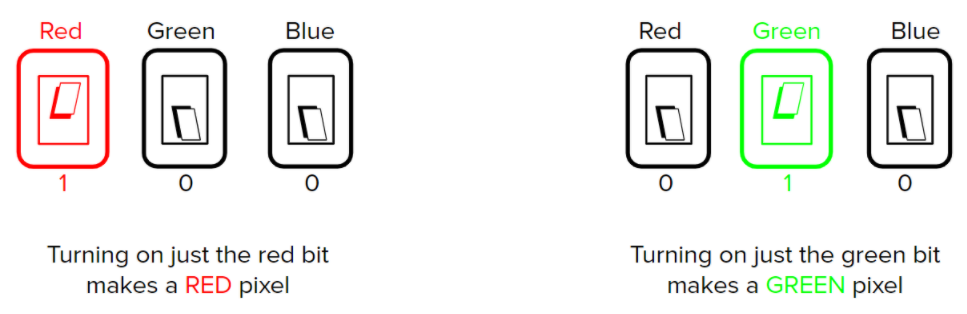
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| **Group Number:** | |
| **Name** | **Role** |
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* **Get introduced to how computers store colors**

In the last lesson, we used 1 bit for each pixel. That meant we had only two choices for each pixel, black and white.



Today we will use 3 bits for each pixel. Each bit will control a different color of light: Red, Green, and Blue



How many different colors can be stored with 3 bits?

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* **Get acquainted with the color pixelation widget**

In the lab we will be using the color pixelation widget. If you haven’t already done so,

- Navigate to [http://studio.code.org](http://studio.code.org/) to create an account

- Join this course. You will need to get the course code from Ms. Pluska

To learn more about the color pixelation widget watch the video below,

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| <https://youtu.be/763E3_Z6Hng> |

To started with the pixelation widget Navigate to <https://studio.code.org/s/pixelation/stage/3/puzzle/1>

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| Use the sliders to adjust image width, height, and bits per pixel.  The first byte displayed in the console represents the width. The second byte represents the height. The third byte represents the bits per pixel. |  |
| Try to create the letter A using the black and white Pixelation Widget. Do this by typing the appropriate bit for each portion of the image (“0” for black, “1” for white). |  |
| Navigate to the next stage (stage 4). Find and delete the extra bit that is causing the image to be distorted. |  |

* **Sample an analog image**

Now that you’ve had a chance to see how to set each pixel black or white, we are going to use the widget to represent an analog image using a process called sampling.

What is an analog? It's a term used to mean something with continuous representation - such as a picture you draw on a piece of paper. Each pencil line smoothly connects to the next, no matter how much you zoomed in on the picture with a magnifying glass.

When we represent an analog image digitally, we will have to make some choices on how to sample the image to get the smoothest representation possible while keeping in mind the number of bits it takes to build that image.

What does it mean to sample? We are choosing how small to make section of the picture we look at when deciding whether to make it black or white. The smaller the sample, the more pixels required to represent that image. Larger samples require less pixels, but the image can become blurry.

Try it out yourself!

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| Navigate to the next stage (stage 5). |  |
| Adjust the sliders to a 6 x 8 grid. Work to digitally represent the image using sampling. To see the image you are trying to create, click the text below the “Save Image” button. |  |
| When you are done, navigate to the next stage (stage 6). Adjust the sliders to whatever sized grid you want. Work to digitally represent the image as you did before. |  |

How many total bits were needed to create the image in Challenge B?

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How long did it take to build?

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How does the new digital image compare to the one from Challenge A. What effect did taking a larger number of samples have on the image?

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* **Create a logo using the pixelation widget**

Navigate to the next stage (stage 7)

Select your favorite company logo and recreate it using the pixilation widget.

How many total bits were needed to create your logo?

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How does the number of bits needed to create your logo compare to your partner?

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* **Complete the reflection**

1. Assume your friend just sent you 32 bits of pixel data (just the 0s and 1s for black and white pixels) that were encoded after sampling an image. Choose the two statements that are true.

* The 32 bits of pixel data is enough to produce the image using the widget. Nothing else is needed.
* The digital image would be an exact copy of the analog image.
* The correct width and height must be input into the pixelation widget to produce the image.
* The fact that only 32 bits were used to represent the image indicates relatively large sample squares were used. The digital image may vary from the analog image significantly.

1. Which of the following would result in a better digital approximation of an analog black and white image?

* Increasing the size of each sample square, thus decreasing the number of samples taken.
* Decreasing the size of each sample square, thus increasing the number of samples taken.
* Using fewer bits to represent the image.
* Using decimal numbers to represent each pixel.

1. Your computer science teacher asks you to sample a black and white image that is 4" x 6". How would you sample the image to provide a good digital approximation using the pixelation widget? What sample size would you use? How would your decision affect the digital representation?

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* **Complete the Receive credit for this lab guide**

Make sure indicate the names of all group members on this lab, the Project Manager is charge of submitting this lab