

CSE 101 Homework 04

Exercises with a green background (■) are designed for practice to gain a basic understanding of a particular concept and can be discussed/debriefed with your Lead, Assistant, and helproom staff.

Exercises with a white background (□) are to be completed on your own and will not be debriefed/discussed by CSE101 staff members. These exercises must be turned in via Angel before your next class session meets. In many cases, your next class will build on the prior day's homework and not having it completed may inhibit your understanding of new class material.

Exercise – Prepare for Encryption Class Exercises

Copy the TrueCrypt-Windows folder from the Day04\Homework-Readings folder to your USB flash drive (do not put it inside your CSE 101 folder). We will be using this software starting on Day 05 to create encrypted data on your USB flash drive.

Data Representation Exercises

1. Your friend tried to convert the following binary data stream to its ASCII character equivalent:
10011011010011101010110100101101111110001111010111110011

The characters are in 7-bit increments and he used the ASCII conversion table we showed on class slides, but his answer was terribly wrong. He got:

Y:Z*}<=>

What did he do wrong, and what is the correct conversion?

2. As you have seen in class, everything about our physical world (numbers, letters, colors, sound, etc.) must somehow be converted into 0s and 1s inside of a computer. This includes when computers, such as cell phones, communicate with one another. Convert the following ASCII message to its binary equivalent in order to send a text message to fellow MSU football rivals:

MSUsmelledTHEroses2014

3. Answer the following RGB (color) related questions:
 - a. What is an RGB value?
 - b. What color does an RGB value of (128, 13, 255) represent in Excel?
 - c. How many different colors could be represented with an RGB scheme if only 3 bits were used to represent each RGB component (3 for R, 3 for G, 3 for B)?
 - d. How many different colors could be represented with an RGB scheme if 8 bits were used to represent each RGB component (8 for R, 8 for G, 8 for B)?
4. An alternative color scheme to RGB is RGBY where an additional color component (Yellow) is added to the traditional Red, Green, and Blue components in order to specify a unique color.
 - a. How many different colors could be represented with an RGBY scheme if 4 bits were used to represent each RGBY component (4 for R, 4 for G, 4 for B, and 4 for Y)?

<ul style="list-style-type: none"> b. How many different colors could be represented with an RGBY scheme if 11 bits were used to represent each RGBY component (11 for R, 11 for G, 11 for B, and 11 for Y)? c. Finally, how many different colors could be represented with an RGBY scheme with 3 bits for Red, 5 bits for Green, 6 bits for Blue, and 8 bits for Yellow? 	<ul style="list-style-type: none"> 5. Create an image of your own in Excel, similar to smiley: <ul style="list-style-type: none"> a. Your grid should be 15 x 15 b. You need to use 6 colors c. Calculate the storage size required for your image, assuming the usage of a full bitmap, with 32-bit representation of colors. Give the answer in bits and in bytes. d. Then create a color table for it and write indices into the grid (similar to what you see in slide 23 of Day 04). However, do not worry about creating 32 bit representations of your colors - it is enough that by each index you write the color name. e. Finally, calculate the storage size required for your image, assuming you used the color table to store it with 32-bit representation of colors (determine how many bits you need to express indices). Give the answer in bits and in bytes.
<ul style="list-style-type: none"> 6. In the Day04 homework folder, we have included an Excel file named Day04HW_Icon.xlsx that contains a bitmap image of one of the most popular symbols in the world. Given an RGB color scheme where an individual color in the full bitmap uses 5 bits for the Red component, 4 bits for the Green component, and 6 bits for the Blue component: <ul style="list-style-type: none"> a. What is the resolution of this image? b. What is the color depth of this image? c. Calculate the storage size required for the full bitmap of this image. Give the answer in bits and bytes. d. In your Excel file, create a color table and write indices into the grid (similar to what you see in slide 23 of Day 04). However, do not worry about creating the full color in the original RGB color scheme – it is enough that next to each index you simply write the color’s name. e. Calculate the storage size required for the GIF of this image, given the color table you created with indices as well as the original RGB color scheme. Give the answer in bits and bytes. f. Finally, calculate the amount of storage size <u>saved</u> between the GIF and full bitmap version of the image. 	<ul style="list-style-type: none"> 7. We have discussed a variety of different ways that a series of 0s and 1s can be interpreted by a computer. Given the following 7-bit binary data stream, what are <u>all</u> the possible data values that this data could represent? <p>1010101</p>