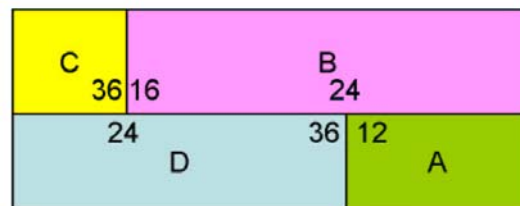
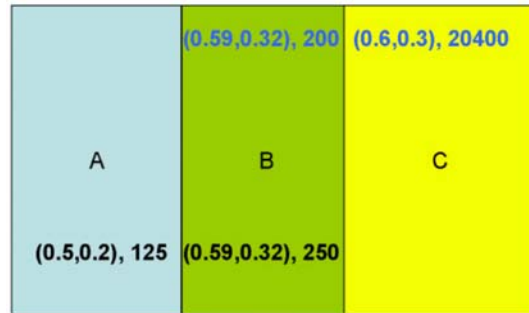


Assignment 3

1. The spectrum of color $C_1 = (X_1, Y_1, Z_1)$ and $C_2 = (X_2, Y_2, Z_2)$ are given by $s_1(\lambda)$ and $s_2(\lambda)$ respectively. Let the color formed by multiplications of the spectrums s_1 and s_2 be s_3 , i.e. $s_3(\lambda) = s_1(\lambda) * s_2(\lambda)$. Is it true that the XYZ coordinate corresponding to s_3 , denoted by C_3 , is (X_1X_2, Y_1Y_2, Z_1Z_2) ? Justify your answer with calculations.
2. The color gamut of a printer is given by triangle ABC on the chromaticity chart where $A = (0.15, 0.65)$, $B = (0.6, 0.3)$ and $C = (0.15, 0.125)$. The color gamut of a monitor is given by triangle DEF on the chromaticity chart where $D = (0.2, 0.05)$, $E = (0.55, 0.4)$ and $F = (0.05, 0.55)$. How many sides does the polygon that represents all the colors that can be produced *both* by the printer and the monitor have? Find the coordinates of all the vertices of this polygon.
3. C_1 and C_2 are colors with chromaticity coordinates $(0.33, 0.12)$ and $(0.66, 0.66)$ respectively. In what proportions should these colors be mixed to generate a color C_3 of chromaticity coordinates $(0.55, 0.48)$? If the luminance of C_3 is 90, what are the luminance of C_1 and C_2 ?
4. When we mix blue paint with yellow paint we get green. But when we project blue light on yellow light, we get brown. How do you explain this contradiction?
5. What is the complementary wavelength of a color with chromaticity coordinate $(0.5, 0.2)$? What is the chromaticity coordinates of this wavelength?
6. Kay and McDaniel categorized colors in six categories corresponding to focal colors red, green, blue, yellow, black and white. How do you think would the sets corresponding to each of these categories look on the chromaticity diagram? Can you accommodate all of them on the chromaticity diagram? If not, why? Illustrate using diagrams.
7. You are in a room and the tungsten bulb seems to be brightest object you see around. Suddenly a much brighter halogen light is brought in and the tungsten lamp suddenly seems to have a lackluster appearance. How do you explain this visual phenomenon?
8. The image on the right shows four different objects A, B, C and D, which have different reflectance. It also shows the gray scale luminance values at the edges. From this information how can you tell if the illumination is continuous or not?



9. The figure on the right shows an image segmented into three parts, A, B and C, based on the detection of edges between the regions. The chromaticity coordinates and the luminance in cd/m^2 on both sides of the edge between B and C are given in blue. The same for the edge between A and B is given in red. Based on this a person comments that there are more than one reason to believe that the former edge is due to illumination and the latter is due to reflectance. Do you agree with him? Justify your answer.



10. You have difficulty in reading very small text on the screen. However, this difficulty reduces as you increase the size of the fonts. Explain this using CSF.

11. You are working in your office which receives good sunlight in the day time. Around dusk when it is getting dark, you find that it is difficult to read the text on the book. You light your table lamp and the text is again legible again. Explain this phenomenon with CSF.

12. In the image on the right, one X looks yellow and the other looks gray though they are the same color as you can see from the place where they are connected. What is this phenomenon and why does this happen?

