提示：由于问题的陈述可能不能完全满足解题条件，所以对某些问题你需要做出一些假设，但这些假设必须是合理的，而且你也需要在作业中给出清晰地说明和解释。

原则：期望你**独立完成**本课程的所有作业，除了课程设计内容之外，本课程没有需要小组协作完成的作业。一般来说，你可以与同学们讨论作业中的问题，但是作业的具体解决方法（包括作业本身）必须是自己独立完成的。

问题

Compute the gray level (luminance) histogram for an image and equalize it so that the tones look better (and the image is less sensitive to exposure settings). You may want to use the following steps:

1. Convert the color image to luminance.
2. Compute the histogram, the cumulative distribution, and the compensation transfer function.
3. Compensate the luminance channel through the lookup table and re-generate the color image using color ratios.

Hint: If you want your computer vision algorithm to only affect the value (luminance) of an image and not its saturation or hue, a simpler solution is to use the even simpler *color ratios*,

$$r=\frac{R}{R+G+B}, g=\frac{G}{R+G+B}, b=\frac{B}{R+G+B}.$$

After manipulating the luma, you can multiply each color ratios by the ratio of the new to old luma to obtain an adjusted RGB triplet.