**Experiment1: Operating images using Python**

**Class \_\_\_\_\_\_\_\_\_\_ Name \_\_\_\_\_\_\_\_\_\_\_\_\_ Student No. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Task1: Image and Multi-dimensional array**

**1. Use PIL and numpy to access image data**

The file “testimage.bmp” is a three-channel color image, via image browsing software, you may know it is a pure red image. Using example script below, you will use **PIL.Image** lib to open the image, and further transfer it to numpy array. Afterwards, you can access the data in the numpy array.

image\_PIL = Image.open("testimage.bmp")  
image\_PIL\_np = np.array(image\_PIL)  
print('shape of the image is {}'.format(image\_PIL\_np.shape))

Please answer following questions by print function or watch variables in debug mode:

1) The width, height, channel number of the image are \_\_\_\_640\_\_\_\_, \_\_\_\_427\_\_\_\_,\_\_\_\_3\_\_\_\_, respectively, corresponding to the \_\_2nd\_\_\_\_\_\_, \_\_\_1st\_\_\_\_\_,\_\_3rd\_\_\_\_\_\_ dimension of the numpy array.

2) Started from the 0 channel, the pixel intensity values in each channel are \_\_\_255\_\_\_\_\_, \_\_\_\_0\_\_\_\_,\_\_\_\_0\_\_\_\_, respectively. Considering the image you saw, the sequence of channels is \_\_RGB\_\_\_\_ (RGB/BRG).

3) By inspecting the ‘dtype’ property of the numpy array, the data type of the array is \_\_\_\_unit8\_\_\_(int32, float, double, uint8, bool).

**2. Showing image with matplotlib and OpenCV**

Given the numpy array obtained below, please try these two methods to show the corresponding image:

*from* matplotlib *import* pyplot *as* plt  
plt.imshow(image\_PIL\_np)  
plt.show()

*import* cv2  
cv2.imshow('winname', image\_PIL\_np)  
cv2.waitKey()

According to the results you obtained, you can infer that the imshow method in matplotlib, assumes images are stored in \_\_\_\_\_\_RGB\_\_\_ (RGB/BGR) format. The imshow method in cv2, assumes images are stored in \_\_\_BGR\_\_\_\_\_\_ (RGB/BGR) format

**3. Other libraries for image**

Please try out different libraries, and answer following questions:

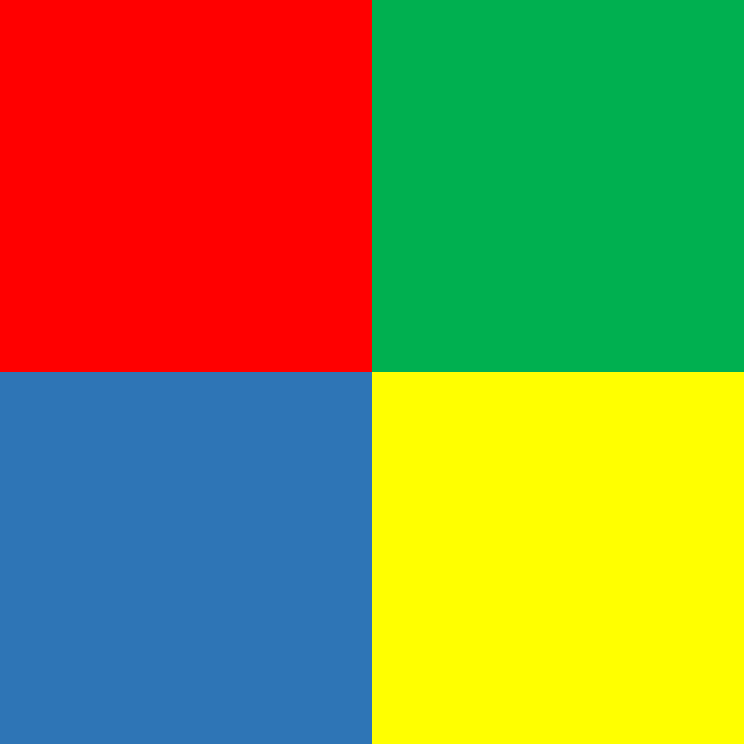
1) Using **imread** method in **imageio** to open image, the channel sequence of array is \_\_\_427\_\_\_, \_640\_ , \_3\_;

2) Using **imread** method in **skimage.io** to open image, the channel sequence of array is \_\_\_427\_\_\_, \_640\_ , \_3\_;

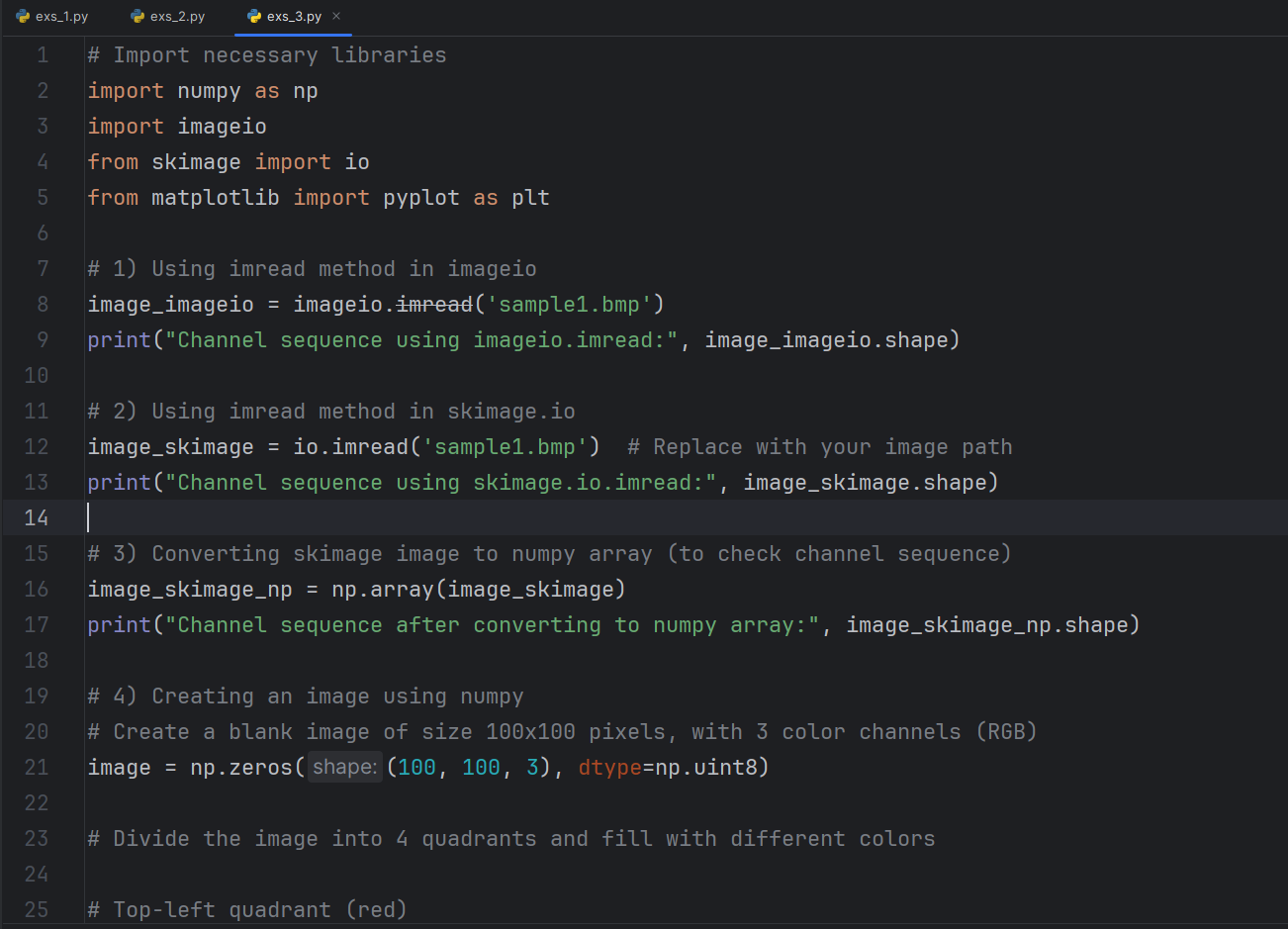
3) Using **imread** method in **skimage.io** to open image (and further transfer to numpy array), the channel sequence of array is \_\_\_427\_\_\_, \_640\_ , \_3\_;

**4. Creating an image using numpy**

Please try to create and save an image (you can do this via imwrite method in **imageio**) shown as following. To realize this, you may need to initialize a numpy array, and fill in appropriate values in specific locations or channels. Please finish this task and provide implemented scripts.



**Your scripts:**





Results:

