Answers for task02a

1. If one observes fig. (a) & (b), it is noticeable that **'Lines Properties'** are preserved in both the images i.e., **parallel lines are parallel** in both images, so we used **'Affine Transform'** here. This is example of 'Shear Transformation'; there is **no translation** in image (b) as the top left point is fixed (same) in both the images. As we need to convert image (b) into image (a), we chose **three points 'P, Q, R'** as shown in the below image. The equation will be **I=A . I'**, where **I** is **undistorted image** matrix and **I' is distorted image** points matrix, this matrices will be of the **size (3,2)**. By solving the equation explain above (of course dimension of matrices has to be changed for matrix multiplication and inverse operation) one can find the **'Affine Transformation' matrix of the size (2,3),** this matrix will then map distorted image to undistorted image using **'cv2.warpAffine'** function. The mathematical operation is shown below:
   I=A . I', (make **I'** 3x3 square matrix) post multiplying this with $\mathbf{I'^{-1}}$, we get $\mathbf{A= I.I'^{-1}}$. By solving this we get A (dimension of matrices has to be changed for matrix multiplication by taking transpose).

2. No difference visible to human eye, but of course selecting points manually in both the images could cause point-to-point correspondence abnormality.
3. Below images shows the corresponding points in both the images:

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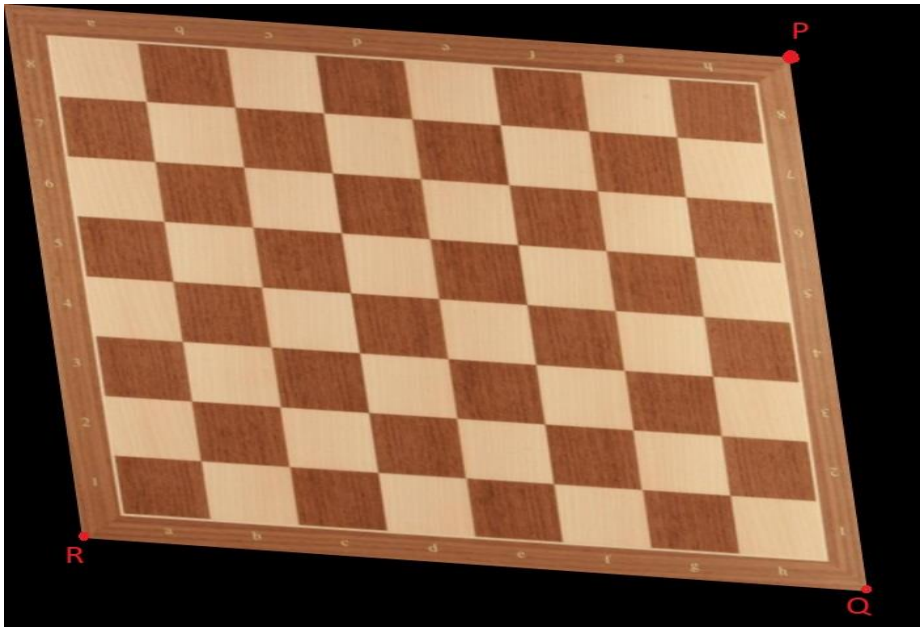
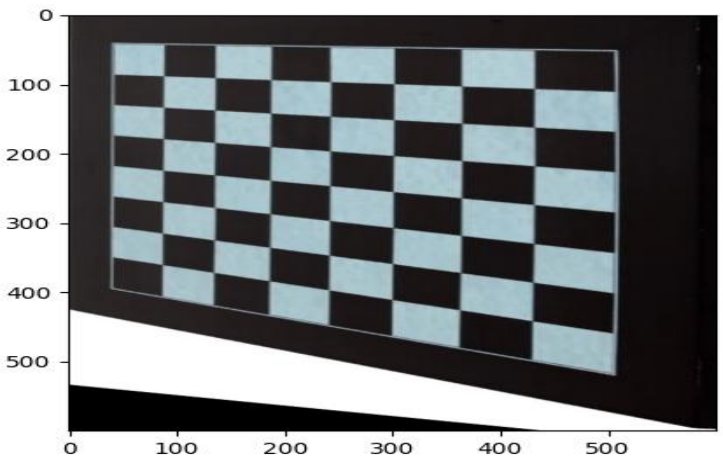


4. In fig. c, it can be seen that **lines properties are not preserved**. Parallel lines are not parallel anymore. So, even If we choose P, Q, R corresponding points we cannot regenerate image (a) using ‘Affine Transform’. We have to use ‘Projective Transform’ which uses 4 corresponding points to map the images. Result of affine transform on fig.c is shown below;



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Things other than asked questions:

To run part 3 of task 02a, uncomment the code in file ‘Affine-trans.py’. We have attached result in the result folder.