Programing Test

<u>Guideline</u>
- Let us test your programming skill.

- You can use whatever language you like.
 Preferred language is C#/C++.

<u>Question 1</u>

Our company creates a camera with sampling moire method. We draw grating patterns on an object. We put a force on the object. We analyze the deformed grating patterns by the camera.
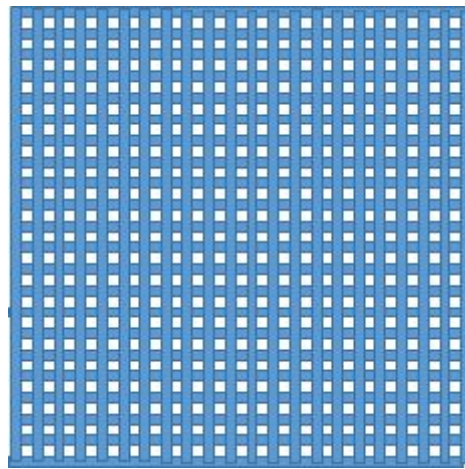
We often use an eraser for demo. We draw grating patterns on the eraser.

The picture 1 shows one-dimensional grating. The brightness of the grating changes from 0 to 255 along X axis.

The picture 2 shows two-dimensional grating. The brightness of the grating changes along Y axis as well as X axis.
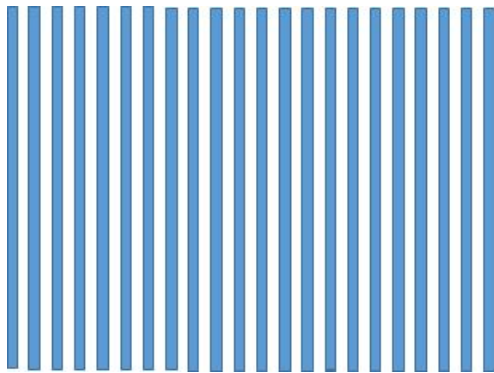
Picture1: One-dimensional grating   Picture2: Two-dimentional grating

<u>Question 1-1</u>

Write a program that prints out one-dimensional grating like Picture 1.

Requirements:
- The grating should have 2 mm pitch(frequency).
- The white part should be 1 mm long.
- The black part should be 1 mm long.

Question 1-2

Write a program that prints out two-dimensional grating like Picture 2.

Requirements:
- The grating should have 2 mm pitch(frequency).
- The grating pattern should not be clear-cut black and white.
- The grating pattern should have cosine waves of brightness horizontally and vertically.

Question 2

Our company often analyzes pictures. But the pictures often have noises in some pixels.

Question 2-1

Write a program that removes noises from a picture.

Requirements:
- You can use any picture as long as it's two dimensional image.
- If a pixel has brightness that is "too different" from surrounding four pixels(up, bottom, right, left), let's assume the pixel has a "noise".
- If the brightness of the pixel is different by more than 10 points than the average brightness of the surrounding four pixels, let's assume that it is "too different".
- If a pixel has a noise, replace its original brightness with the average brightness of the surrounding four pixel.

Question 2-2

Write a program that removes noises from a picture.

Requirements:
- You can use the same picture you used in Question 2-1.
- If a pixel has brightness that is "too different" from surrounding nine pixels(including the pixel itself), let's assume that the pixel has a "noise".
- If the brightness of the pixel is different by more than 10 points than the average brightness of the surrounding nine pixels, let's assume it is "too different".
- If a pixel has a noise, delete four pixels that are relatively different;
Two pixels with lower brightness. Two pixels with the higher brightness.
And replace its original brightness with the average of the 5 pixels left.

Question 2-3

Explain pros and cons of the two programs in Question 2-1 and Question 2-2.

How to share your code:

We'll create a repository in github for you.

If you already have a github account, let us know.
We'll add you as a collaborator for the repository.

If you don't have a github account, please create an account.
It's free and very popular among programmers.