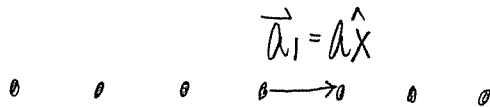


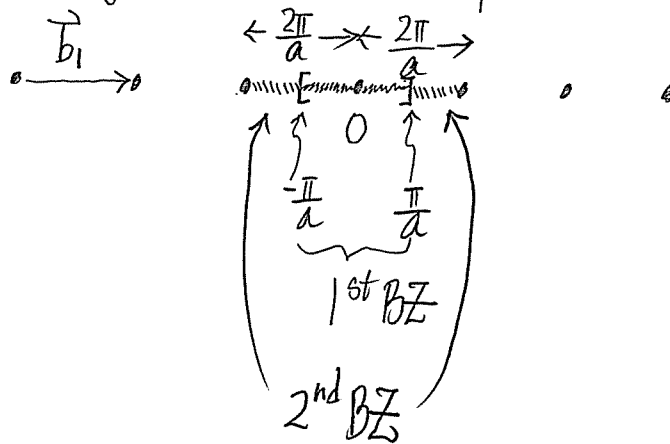
# First Brillouin Zone, Second Brillouin Zone, ...

## 1D lattice

▪  $\vec{a}_1 = a \hat{x}$



▪  $\vec{b}_1 = \frac{2\pi}{a} \hat{x}$  generates the reciprocal lattice



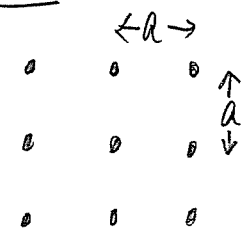
$$\vec{G} = n \frac{2\pi}{a} \hat{x}, \text{ where } n = 0, \pm 1, \pm 2, \dots$$

$\vec{G}$   
reciprocal lattice vectors

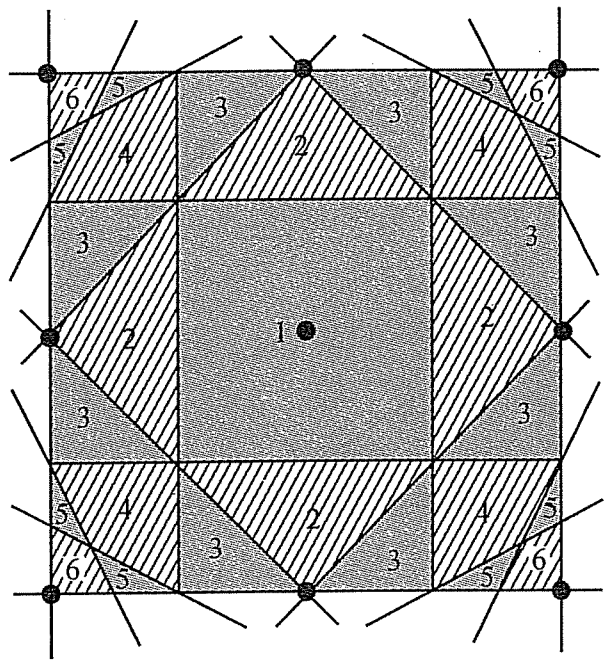
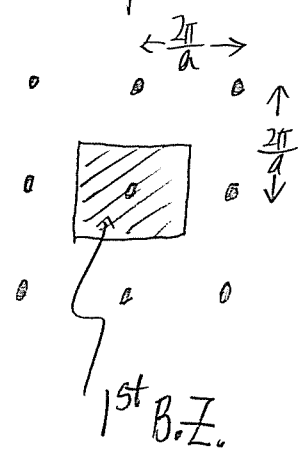
2<sup>nd</sup> BZ: { patches of reciprocal space that are "second" nearest to "0"  
patches can be translated into 1<sup>st</sup> BZ by  $\vec{G}'$ 's.

# 2D square lattice

•  $\vec{a}_1 = a\hat{x}, \vec{a}_2 = a\hat{y}$



•  $\vec{b}_1 = \frac{2\pi}{a}\hat{x}, \vec{b}_2 = \frac{2\pi}{a}\hat{y}$  generate the reciprocal lattice, which is also a square lattice



← { 1st BZ, 2nd BZ, 3rd BZ } are fully shown