Reciprocal lattice：

The reciprocal lattice is the Fourier transform of real space lattice. Direct lattice is represent coordinate in real space and reciprocal lattice is represent the K space.

倒格矢是正格矢的傅里叶变换。代表 K 空间的动量坐标。

Brillouin Zone

The Wigner-Seitz cell cell of the reciprocal lattice is called Brillouin Zone.

Define the Brillouin Zone.

First we choose the basic vector of direct lattice in real space. called a_1, a_2, a_3

So the reciprocal lattice vector can be written as b_1, b_2, b_3

Here we have

$$b_1 = \frac{2\pi}{\Omega}\left(a_2 \times a_3\right)$$

$$b_2 = \frac{2\pi}{\Omega}\left(a_3 \times a_1\right)$$

$$b_3 = \frac{2\pi}{\Omega}\left(a_1 \times a_2\right)$$

$$\Omega = a_1 \cdot \left(a_2 \times a_3\right)$$

After we have the reciprocal lattice vector, we just need to find it Wigner-Seitz cell of b_1, b_2, b_3 is the Brillouin Zone.