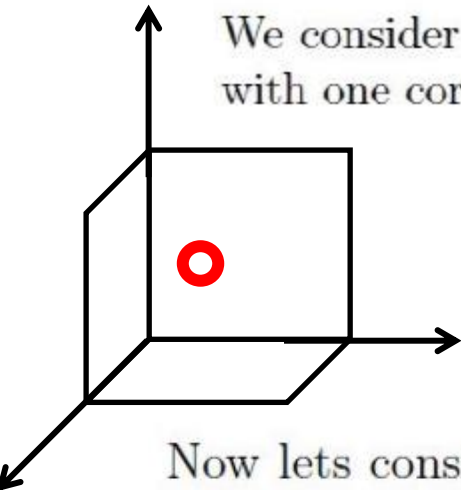## Particle in a 3D-box

We consider a particle in a box with lengths a, $,b$, and c which is centered with one corner at the origin. The potential is then given by

$$V(x, y, z) = \begin{cases} & 0 < x < a \\ & 0 < y < b \\ & 0 < z < c \\ \infty & \text{elsewhere} \end{cases}$$

Now lets consider a cube, i.e. $a = b = c$. The energy of a particle in cubic box becomes

$$E = \frac{h^2}{8m}\left(\frac{n_x^2}{a^2} + \frac{n_y^2}{a^2} + \frac{n_z^2}{a^2}\right) = \frac{h^2}{8ma^2}(n_x^2 + n_y^2 + n_z^2)$$

and a wavefunction

$$\psi(x, y, z) = \left(\frac{8}{abc}\right)^{1/2} \sin\left(\frac{n_x \pi x}{a}\right) \sin\left(\frac{n_y \pi y}{b}\right) \sin\left(\frac{n_z \pi z}{c}\right)$$