$Time\ independent\ Schrodinger\ Equation\ in\ one\ spatial\ Dimension.$

$$\frac{2m}{\hbar}(\text{V-E})\ \Psi\ = \frac{d^2}{dx^2}\Psi$$

$for\ 0\ <\ x\ <\ l \Rightarrow V\ =\ 0;\ (V\ -\ E)\ =-\ E.$

$$\frac{2m}{\hbar}(\text{-E})\ \Psi\ = \frac{d^2}{dx^2}\Psi$$

$Solution\ to\ this\ differential\ equation$:

$$\Psi(x)\ = c_1 sin(\frac{\sqrt{2mE}}{\hbar}x)\ +\ c_2 cos(\frac{\sqrt{2mE}}{\hbar}x)$$

$Boundary\ Conditions$:

$$x\ =\ 0 \Rightarrow \Psi\ =\ 0;\ x\ =\ l \Rightarrow \Psi\ =\ 0$$

$By\ substituting\ the\ boundary\ conditions$:

$$\Psi(x)\ = c_1 sin(\frac{n\pi}{l}x)$$

$By\ the\ normalization\ Condition$:

$$\int_0^l \left[c_1 sin(\frac{n\pi}{l}x)\right]^2 dx\ =\ 1 \Rightarrow c_1\ = \sqrt{\frac{2}{l}}$$

$Solution\ of\ the\ schrodinger\ equation\ to\ the\ infinite\ square\ box\ problem$:

$$\Psi(x)\ = \sqrt{\frac{2}{l}} sin(\frac{n\pi}{l}x)$$