Chapter 1 Wave Function

Section 1.6: Heisenberg uncertainty principle

According to Heisenberg uncertainty principle is given by $\sigma_x \sigma_p \geq \frac{\hbar}{2}$

Where σ_x is error in measurement of position i.e. $\Delta x = \sqrt{\langle x^2 \rangle - \langle x \rangle^2}$ where $\langle x^2 \rangle$ is average of x^2 and $\langle x \rangle$ is average value of x.

Where σ_p is error in measurement of momentum i.e. $\Delta p = \sqrt{\langle p^2 \rangle - \langle p \rangle^2}$ where $\langle p^2 \rangle$ is average of x^2 and $\langle p \rangle$ is average value of p.

If error in position will increase then error in momentum will decrease. In same way if error in momentum will increase the error in position will decrease such that $\sigma_x . \sigma_y$ will some fix value and always greater or equal to $\frac{\hbar}{2}$