

Quantum Calculations on a Ring II

In this activity, your group will carry out calculations on the following quantum state on a ring:

$$|\Psi\rangle = \frac{3}{5}| - 1\rangle + \frac{4}{5}|2\rangle$$

1. You carry out a measurement to determine the energy of the particle at time $t = \frac{I\pi}{6\hbar}$. Calculate the probability that you measure the energy to be $\frac{\hbar^2}{2I}$. What representation/basis did you use to do this calculation and why did you use this representation?
2. You carry out a measurement to determine the z-component of the angular momentum of the particle at time $t = \frac{I\pi}{6\hbar}$. Calculate the probability that you measure the z-component of the angular momentum to be $-\hbar$. What representation/basis did you use to do this calculation and why did you use this representation?
3. Calculate the probability that the particle can be found in the region $0 < \phi < \frac{\pi}{3}$. What representation/basis did you use to do this calculation and why did you use this representation?
4. You carry out a measurement on the location of the particle at time, $t = 0$. Calculate the probability of finding the particle in the region $0 < \phi < \frac{\pi}{3}$.
5. You carry out a measurement on the location of the particle at time, $t = \frac{I\pi}{6\hbar}$. Calculate the probability of finding the particle in the region $0 < \phi < \frac{\pi}{3}$.

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