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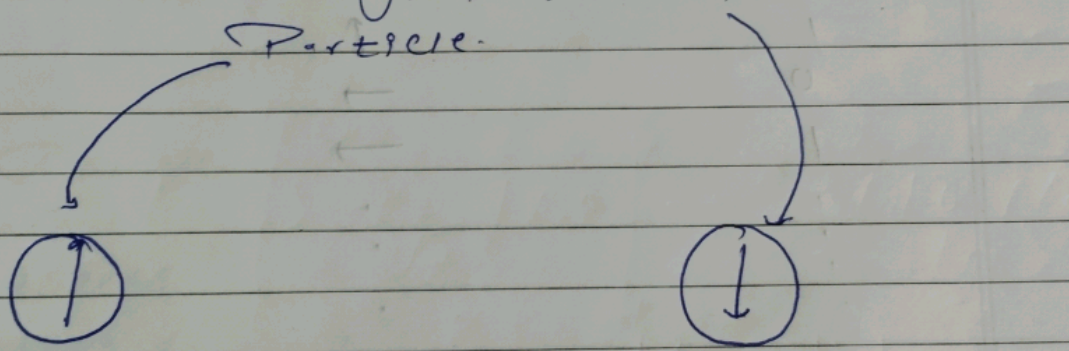
DAY 11 TASK

EPR Paradox

A. Einstein , B. Podolsky , N. Rosen

How can quantum mechanics be right when 3 geniuses like us think it's Hogwash?

Quantum entanglement is stupid!



"Collapse of the wave function"

Local Realism

Quantum mechanics If our first measurement in ↑ direction gave us ↑, and then measured in → direction, then!

$$|\uparrow| = \frac{1}{\sqrt{2}}|\rightarrow\rangle + \frac{1}{\sqrt{2}}|\leftarrow\rangle$$

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$(\frac{1}{4})^2 = \frac{1}{2}$ $(\frac{1}{4})^2 = \frac{1}{2}$

50% chance spin right

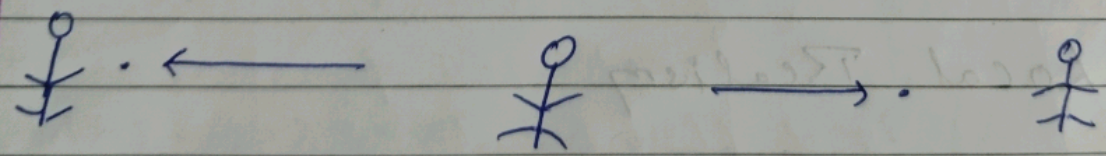
50% chance spin left

Hidden Variable, λ

Measurement time	Measurement direction	Result
0	↑	↑
1	↑	↓
0	→	←
1	→	←
⋮	⋮	⋮

Bells Test

A CHSH B



X, Y ±1 X, Y

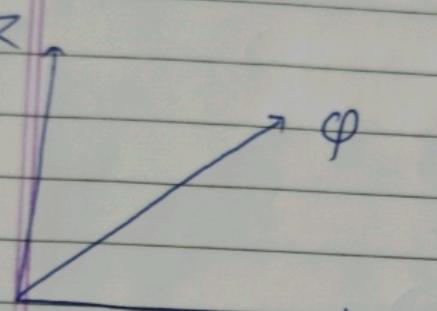
$\langle A_x B_x \rangle + \langle A_x B_y \rangle + \langle A_y B_x \rangle - \langle A_y B_y \rangle$

$(A_x + A_y) B_x + (A_x - A_y) B_y$

≤ 2

Locality + Realism

8 Possible Combinations of spin states for each Particle (Jo Hidden variable universe)



All Possible events for Alice's Particle 1.

E_1 : Z+, X+, φ+
E_2 : Z+, X+, φ−
E_3 : Z+, X−, φ+
E_4 : Z+, X−, φ−
E_5 : Z−, X+, φ+
E_6 : Z−, X+, φ−
E_7 : Z−, X−, φ+
E_8 : Z−, X−, φ−

Bell's Inequality

$$P(Z+, X+) \leq P(Z+, \varphi+) + P(\varphi+, X+)$$

$$\frac{E_3 + E_4}{8} \leq \frac{E_2 + E_4 + E_3 + E_7}{8}$$

$$E_3 + E_4 \leq E_3 + E_4 + E_2 + E_7$$