# Quantum Supremacy

The phrase **'quantum supremacy'** was coined in the year **2011** by John Preskill, Professor of Theoretical Physics at the California Institute of Technology.

- Quantum supremacy refers to a problem-solving process by the **quantum computer** that cannot be solved by a classical computer in its normal lifetime.
  - The concept is related to the speed at which a quantum computer performs.
- Quantum computers are different from binary digital electronic computers that are based on transistors (a semiconductor device used to amplify or switch electronic signals and electrical power).
  - The common digital computing requires the data to be **encoded into binary digits (bits), each of which is always in one of two definite states (0 or 1).**
  - Quantum computation uses **quantum bits (qubits).**

**Quantum Bit (Qubit)**

A quantum bit (qubit) is the smallest unit of quantum information, which is the quantum analog of the regular computer bit, used in the field of quantum computing.

- They operate according to **two key principles** of quantum physics: **superposition and entanglement.**
  - **Superposition** means that each qubit can **represent both a '1' and a '0' at the same time.**
  - **Entanglement** means that qubits in a superposition state can be **correlated with each other; that is, the state of one qubit (whether it is a 1 or a 0)** can depend on the state of another qubit. It means that particles remain connected so that actions performed on one affect the other, even when separated by great distances. The phenomenon so riled Albert Einstein that he called it "spooky action at a distance."
  - Using these two principles, qubits can act as more sophisticated switches, enabling quantum computers to function in ways that allow them to solve difficult problems that are unmanageable using today's computers.

- According to research, the quantum processor took 200 seconds to perform a calculation that would have been accomplished in 10,000 years by the world's **fastest supercomputer 'Summit'.**

**Source: IE**