Particle PHYS - the standard Model

Fermions and Boson - all particles in 3D space are either fermions or Bosons

the difference is whether a particles spin is an integer or a half integer

because fermions have non integer spin, they conform to the Pauli exclusion principle

You cant have more than 1 of the same particle in the same place at 1 time

You can have as many bosons (ie light) as you want.

3 Matter particles - Electron, Up quark, down quark ~ Nuetrinos

protons - 2UQ, 1DQ Neutrons 2DQ 1UQ

Nuetrino - ultra light, barely interact with anything - Pass through US All the time

Electrons - muon, tau heavier DQ - Strange, bottom UQ - Charm, top

Electron Nuetrino, Tau Nuetrino, Muon Nuetrino, the other gens are unstable

the Dirac Equation $(i\gamma^{\mu}\partial_{\mu} - m)\phi = 0$ describes Particles

Forces! 3, electromagnetism, strong force, weak force

Electromagnetism, acts on all the particles, except Nuetrinos, electricly Nuetral

StrongForce, acts on quarks, protons, Neutrons Photon, Gluon,

gluon doesnt release radially, its a flux tube Q~~~Q when pulled - stronger

Weak force → Decay B radioactive decay, W Z bosons acts on All particles

Higgs Boson - None of the other particles have mass, higgs field - travels out ward giving particles Mass

Grand Unified Theory - All one force?

gravity, found gravitational waves, graviton particles?

Doesnt account for dark matter

matter → Fermions

Leptons: Electrons, Muon, Tau; Electron Neutrino, Muon Neutrino, Tau Neutrino

Quarks: Up Charm Top; Down Strange Bottom

Force carriers / Exchange particles → Bosons

Higgs Boson

Gluon Photon Z Boson W Boson