# Model Name:

## Uniform Acceleration Particle Model

- **Description**

  Particle moving with uniform acceleration

- **Properties**
  - **Measure**

    Position ($x$) → m

    Time ($t$) → s
  - **Calculate**

    Displacement ($\Delta \bar{x}$) → m

    velocity ($\bar{v}$) → m/s

    acceleration ($\bar{a}$) → $m/s^2$ or m/s/s

$$\bar{a} \equiv \frac{\Delta \bar{v}}{\Delta t} = \frac{\bar{v}_f - \bar{v}_i}{t_f - t_i}$$

# Representations

- Graphical
  - Position - time
  - Velocity - time
  - Acceleration - time
  - Position - $(\text{time})^2$
  - $(\text{Velocity})^2$ - Position
- Written/Verbal Descriptions
- Diagrammatic
  - Motion Maps
  - Velocity
  - Acceleration
- Mathematically

$$\bar{a} = \frac{\Delta \bar{v}}{\Delta t}$$

# Rules of Behavior

- Position-time → $x^2$ (parabola)
  Velocity-time → $x^1$ (line with slope)
  acceleration-time → $x^0$ (horizontal line)
- Look at slopes when going from
  x-t → v-t → a-t
- Look at area between function and time axis when going
  from a-t → v-t → x-t
- When velocity and acceleration vectors are in the same direction, the object increases in speed
- When velocity and acceleration vectors are in opposite directions, the object decreases in speed

# Motion of Soccer Ball

- Only when ball is in air
- Whiteboard
  - 3 graphs
  - Equation (quadratic) on x-t
  - Equation (linear) on v-t