1. Mind Map: Center of Mass

- Centre of Mass (COM)
  - Definition
    - COM is the point where the object's mass is concentrated
    - External forces act through COM
  - Symmetry of Objects
    - For a symmetrical object, the COM is located at the geometric center
    - In irregularly shaped objects, finding the COM may require more complex calculations
  - Key Idea
    - Ball's COM: Moves in a predictable parabolic path
    - Baseball Bat's COM: erratic motion, but CM follows parabolic arc
  - Calculating COM
    - For two masses: $x_{cm} = (m_a x_a + m_b x_b) / (m_a + m_b)$
      - If $m_b = 0$: CM = x_a
      - If $m_a = m_b$: CM lies midway b/w x_a and x_b
    - Adding a third mass m_c: $x_{cm} = (m_a x_a + m_b x_b + m_c x_c) / (m_a + m_b + m_c)$
    - General equation for n particles: $x_{cm} = (1/M) * \Sigma(m_i x_i)$ (i=1 to n)
    - Similar equations for y and z coordinates
      - $y_{cm} = (1/M) * \Sigma(m_i y_i)$ (i=1 to n)
      - $z_{cm} = (1/M) * \Sigma(m_i z_i)$ (i=1 to n)
  - Coordinate System Selection
    - Choosing a convenient system simplifies calculations
    - Placing one mass at the origin can streamline the process