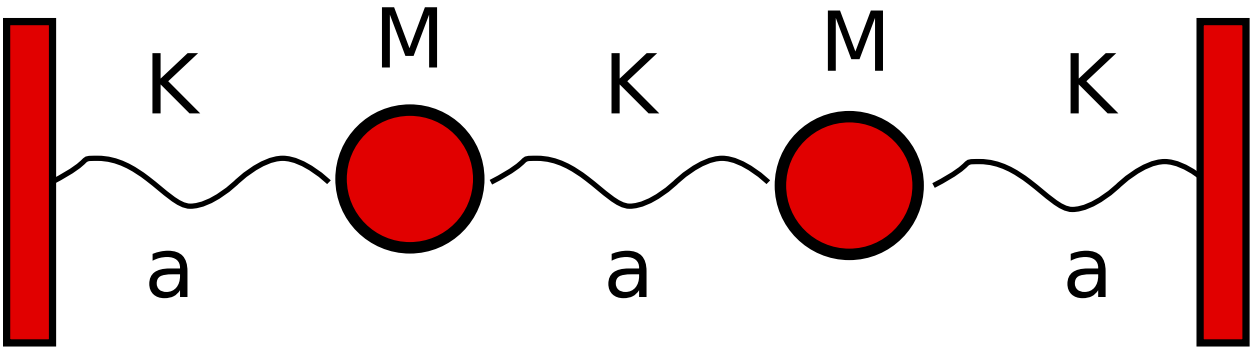
Modes of oscillation

Examine the masses M and springs K shown in the figure. The masses move in the horizontal direction only (1-dimension) and the springs of length a are attached to fixed blocks at the ends at $x = 0$ and $x = L = 3a$.



1. Write Newton's coupled equations of motion for the masses and solve for the modes and their frequencies. Hint: the solutions will be symmetric and/or antisymmetric.

2. Compare the amplitudes of your modes $x_j(t) = x_j e^{i\omega t}$ with the functions $x_j^{(k)} = \sin(kaj)$ and compare the frequencies with $\omega(k) = 2\sqrt{K/m}\sin(ka/2)$. What are the values of k for each mode?