

Springs in Series & Parallel

Aside from cutting springs, SEE 2020 HW1 #11, putting them in series or parallel is an F=ma favorite.

These questions are all about finding the effective spring constant of the new construction.

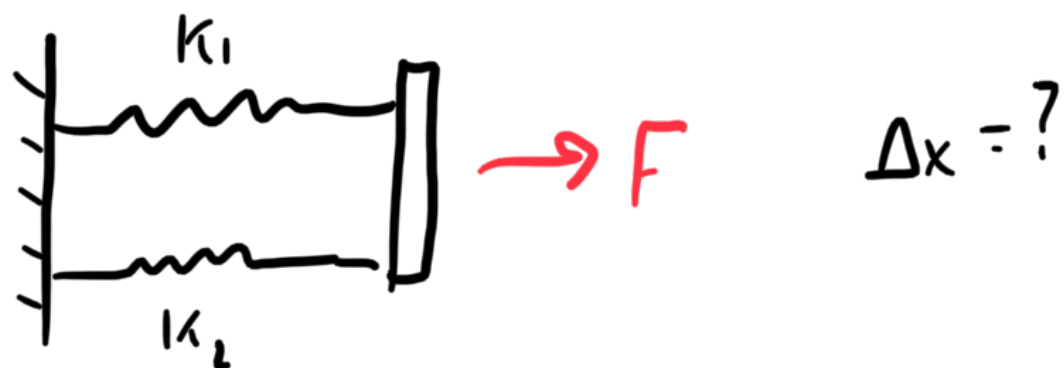
Let's consider two scenarios.

In Series



First, the blue point moves by $\Delta x/2$ by symmetry. That point also has F exerted on both sides since it is in equilibrium. So, $\Delta x/2 = F/k$ and $\Delta x = 2F/k$.

In Parallel



Here, both springs are extended the same Δx .

So, we can write a system of two equations,

$$\Delta x = \frac{F_1}{k_1} = \frac{F_2}{k_2} \quad \text{and} \quad F_1 + F_2 = F$$

$$k_1 \Delta x + k_2 \Delta x = F \quad \text{so} \quad \boxed{\Delta x = \frac{F}{k_1 + k_2}}$$

Homework

Solve the in-series system with two different spring constants, $k_1 \neq k_2$.

Hint: the equilibrium condition is the same.