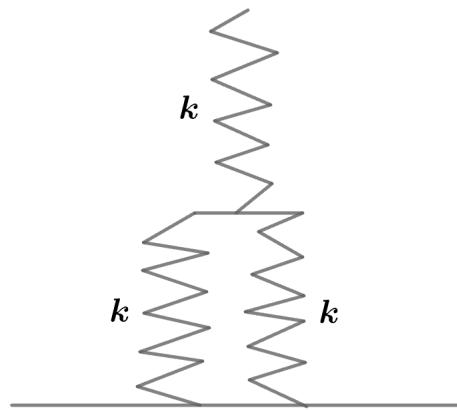


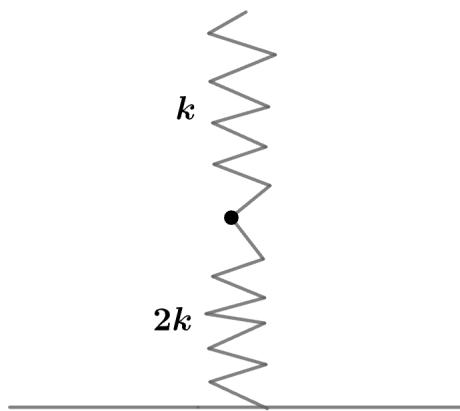
## 2012 F=ma Exam: Problem 21

Kevin S. Huang

Note that the 10 N platform only shifts the equilibrium height of the spring system. We can neglect it when calculating how much an external force compresses the system, since the change in height is independent of the starting height. Thus, we have a system of three springs:



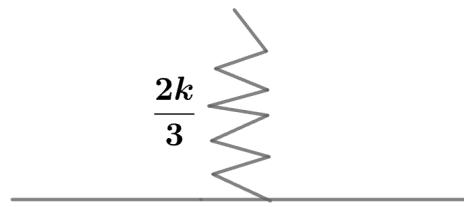
The bottom two springs are connected in parallel so they can be replaced by a single spring with constant  $k + k = 2k$ .



The resulting two springs are connected in series so they can be replaced by a single spring with constant  $k_e$  such that

$$\frac{1}{k_e} = \frac{1}{k} + \frac{1}{2k} = \frac{3}{2k}$$

$$k_e = \frac{2k}{3}$$



If a ball of weight  $W$  is placed on this spring, it will compress by

$$d = \frac{W}{2k/3} = \frac{3W}{2k} = \frac{3(5\text{ N})}{2(75\text{ N/m})} = 0.1\text{ m}$$

so the answer is C.