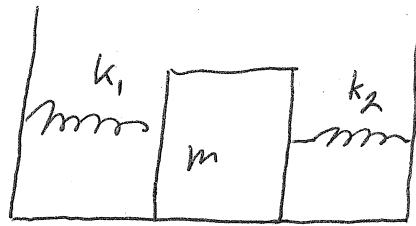
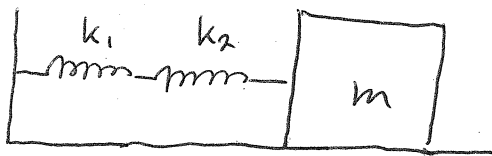


1



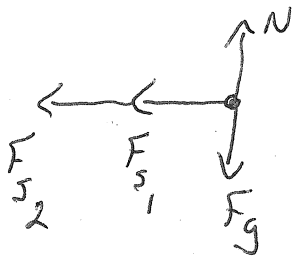
2



3

Determine the effective spring constant for each case.

1

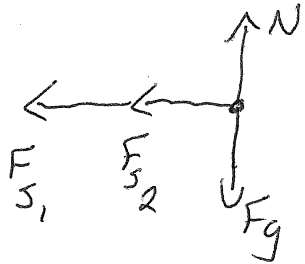


$$F = F_{s_1} + F_{s_2} = k_1 x + k_2 x$$

$$F = (k_1 + k_2) x$$

$$k_{eff} = k_1 + k_2$$

2

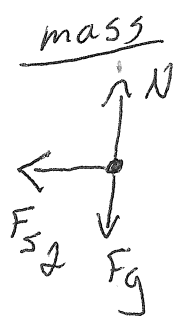


$$F = F_{s1} + F_{s2} = k_1 x + k_2 x$$

$$F = (k_1 + k_2) x$$

$$k_{eff} = k_1 + k_2$$

3



$$F = F_{s2} = k_2 x_2$$

spring coupling



$$F_{s1} = F_{s2}$$

$$k_1 x_1 = k_2 x_2$$

total displacement

$$x = x_1 + x_2$$

$$k_1 (x - x_2) = k_2 x_2$$

$$k_1 x - k_1 x_2 = k_2 x_2$$

(3)

$$k_1 x = k_2 x_2 + k_1 x_2$$

$$k_1 x = (k_1 + k_2) x_2$$

$$\frac{k_1 x}{k_1 + k_2} = x_2$$

$$F = k_2 \left(\frac{k_1 x}{k_1 + k_2} \right) = \left(\frac{k_2 k_1}{k_1 + k_2} \right) x$$

$$k_{\text{eff}} = \left(\frac{k_1 k_2}{k_1 + k_2} \right) x$$