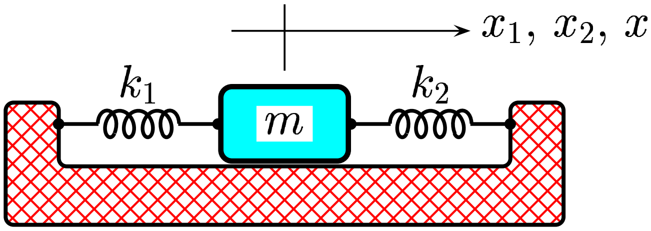
Consider the mass-spring system shown. The setup is as follows. At equilibrium, the mass is located at the origin, (both spring 1 and 2 are in relaxed states). The forces exerted by the individual springs, and by both springs are respectively given by $F_1 = -k_1\, x_1$, $F_2 = -k_2\, x_2$, and $F = -k\, x$.



$$k = \frac{1}{\dfrac{1}{k_1} + \dfrac{1}{k_2}}$$

The pair of relationships which describe the present set up is given by

A) $x = x_1 = x_2$ and $F_1 - F_2 = F$.
B) $x = x_1 + x_2$ and $F_1 - F_2 = F$.
C) $x = x_1 = x_2$ and $F_1 + F_2 = F$.
D) $x = x_1 + x_2$ and $F_1 + F_2 = F$.

Since there is a common origin, and the 3 axes, x_1 , x_2 and x , coincide.
Therefore the locations of the mass measured in terms of these 3 coordinates are the same; *i.e.*, $x = x_1 = x_2$.
Let us check the signs of the forces.
First consider the case: $x = x_1 = x_2 = a > 0$.
By inspection, here $F_1 < 0$, $F_2 < 0$ and $F < 0$.
Here all 3 forces have the same sign.
From the figure, one sees that the relation: $F_1 + F_2 = F$ is correct.
The equality $x = x_1 = x_2$. is valid throughout oscillations.
In turn the "same-sign feature", and also the relation $F = F_1 + F_2$ are valid throughout oscillations.
Answer **C** .