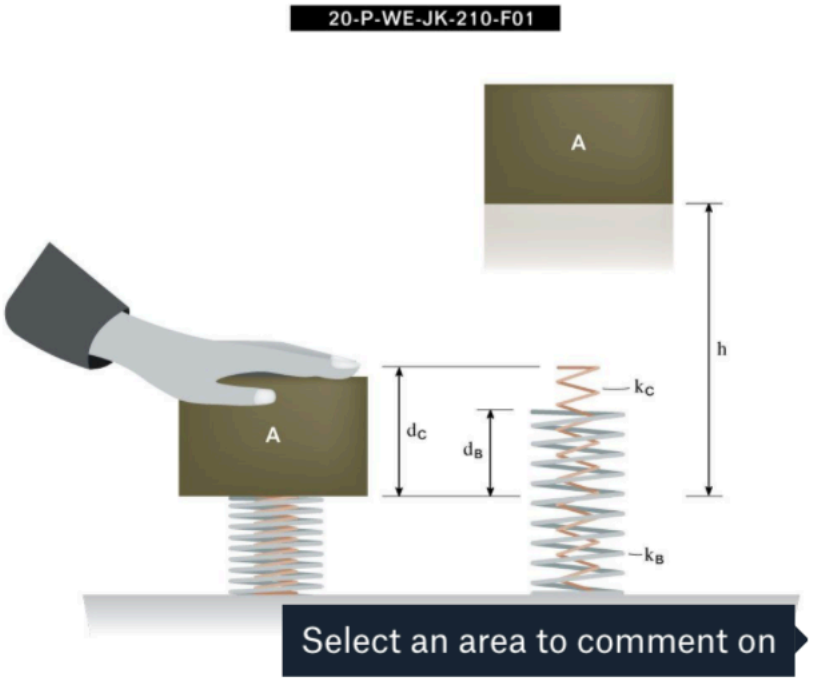
20-P-WE-JK-223-P14-67
Problem 14-67 from Hibbeler 14th edition

Block A is placed on top of two nested springs B and C and then pushed down as shown. It is then released. Determine "h" the maximum height to which it will rise.



Weight A = 30 pound
kB = 200 lb/in
outside spring, depressed
hB = xB= 4 inches
kC = 100 lb/in
inside spring, depressed
hC =xC= 6 inches

Remember from free fall motion that the maximum height means that the velocity is zero

Doing this in imperial pounds-inches made my head hurt.

$$\frac{1}{2}k_B(x_B^2) + \frac{1}{2}k_C(x_C^2) = m\ g\ h$$

(½) (200) (4^2) + (½) (100) (6^2) = (30 lb) (h) so h = 113 inches

$$h = \frac{k_B(x_B^2) + k_C(x_C^2)}{2\ m\ g}$$

Feel free to convert to metric SI
1 pound = 4.44822 N = 0.435492 kg
1 inch is exactly 2.54 cm = 0.0254 m
30 pounds = 13.61 kg
k_B = 200 lb/inches = 35025 N/m
k_C = 100 lb/inches = 17512 N/m
6 inches = 0.1524 m
4 inches = 0.1016 m
Answer: 113 inches
spring potential energy = 180.8 J + 203.3 J = 384.1 J h = 2.88 m = 113 inches

(answer in the back of the book is wrong. It says 133 inches. Typo. The instructor solution manual = 113 inches.)