STEP III, 2004, Q10

10 A particle P of mass m is attached to points A and B, where A is a distance $9a$ vertically above B, by elastic strings, each of which has modulus of elasticity $6mg$. The string AP has natural length $6a$ and the string BP has natural length $2a$. Let x be the distance AP.

The system is released from rest with P on the vertical line AB and $x = 6a$. Show that the acceleration $\ddot{x}$ of P is $\frac{4g}{a}(7a - x)$ for $6a < x < 7a$ and $\frac{g}{a}(7a - x)$ for $7a < x < 9a$.

Find the time taken for the particle to reach B.