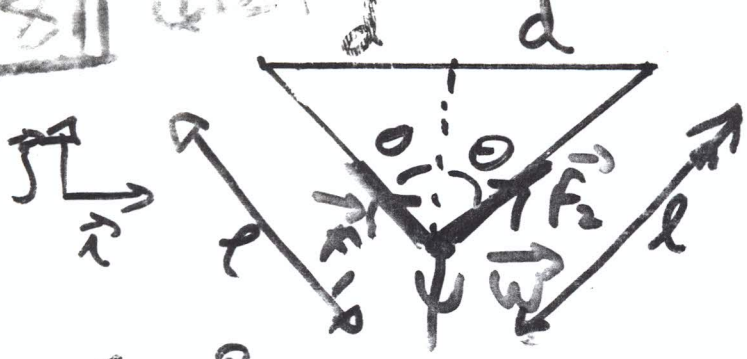

$\vec{F_1} = -F_1 \sin\theta \vec{i} + F_1 \cos\theta \vec{j}$

$\vec{F_2} = F_2 \sin\theta \vec{i} + F_2 \cos\theta \vec{j}$

$\vec{\omega} = -mg\vec{j}$.

Equil in the $\vec{i}$ dirn $\Rightarrow F_1 \sin\theta = F_2 \sin\theta$

$\Rightarrow F_1 = F_2$.

$\Rightarrow k_1(l - l_1) = k_2(l - l_2)$

$\Rightarrow k_1 l - k_1 l_1 = k_2 l - k_2 l_2$

$\Rightarrow k_1 l - k_2 l = k_1 l_1 - k_2 l_2$

$\Rightarrow l = \dfrac{k_1 l_1 - k_2 l_2}{k_1 - k_2}$

Now $\sin\theta = \dfrac{d}{l} \Rightarrow \sin\theta = \dfrac{d}{\frac{k_1 l_1 - k_2 l_2}{k_1 - k_2}}$

$\Rightarrow l\sin\theta = \dfrac{d(k_1 - k_2)}{k_1 l_1 - k_2 l_2}$ (as required)

(b) SHM with $A = 0.2\,m$.

Bodies not to leave platform then max accel $= g$

i.e.

$\omega^2 A \leq 9.8$

$\Rightarrow \omega^2 (0.2) \leq 9.8$

$\Rightarrow \omega^2 \leq 49$

Take ω at max value $\omega = 7$.

Then $T = \dfrac{2\pi}{\omega} = \dfrac{2\pi}{7} = 0.8977$ seconds

$\Rightarrow$ No of oscillations per minute $= \dfrac{60}{0.8977}$

$= 66$ to nearest integer