STEP III, 2001 Q9

9 B_1 and B_2 are parallel, thin, horizontal fixed beams. B_1 is a vertical distance $d\sin\alpha$ above B_2, and a horizontal distance $d\cos\alpha$ from B_2, where $0 < \alpha < \pi/2$. A long heavy plank is held so that it rests on the two beams, perpendicular to each, with its centre of gravity at B_1. The coefficients of friction between the plank and B_1 and B_2 are μ_1 and μ_2, respectively, where $\mu_1 < \mu_2$ and $\mu_1 + \mu_2 = 2\tan\alpha$.

The plank is released and slips over the beams experiencing a force of resistance from each beam equal to the limiting frictional force (i.e. the product of the appropriate coefficient of friction and the normal reaction). Show that it will come to rest with its centre of gravity over B_2 in a time

$$\pi\left(\frac{d}{g(\mu_2-\mu_1)\cos\alpha}\right)^{\frac{1}{2}}.$$