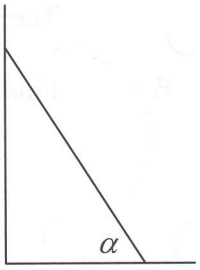
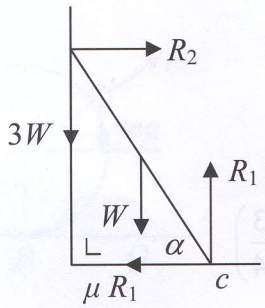
7. **(a)** One end of a uniform ladder, of weight W, rests against a smooth vertical wall, and the other end rests on rough horizontal ground. The coefficient of friction between the ladder and the ground is μ.
The ladder makes an angle α with the horizontal and is in a vertical plane which is perpendicular to the wall.



2010

Show that a person of weight $3W$ can safely climb to the top of the ladder if

$$\mu > \frac{7}{8\tan\alpha}.$$



horizontal	$R_2 = \mu R_1$	5
vertical	$R_1 = 4W$	5
	$\Rightarrow R_2 = 4\mu W$	
moments about c :	$R_2(\ell\sin\alpha) = W(\frac{1}{2}\ell\cos\alpha) + 3W(\ell\cos\alpha)$	5
	$R_2(\tan\alpha) = \frac{7W}{2}$	5
	$4\mu W(\tan\alpha) = \frac{7W}{2}$	
	$\Rightarrow \mu = \frac{7}{8\tan\alpha}$	5
		25