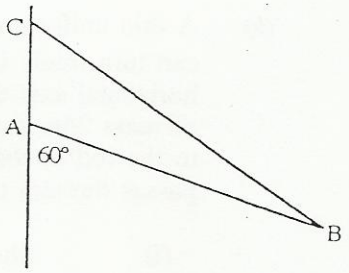
7(b)

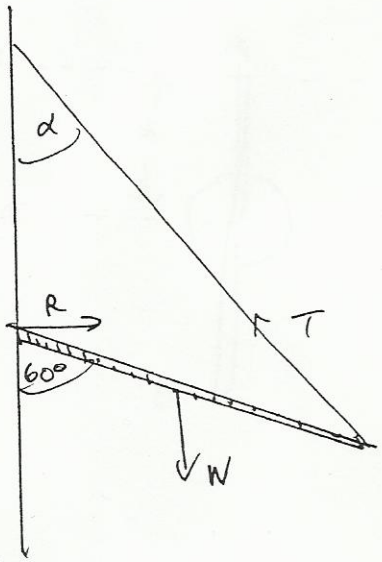
1997

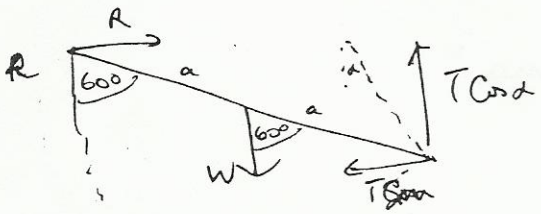
(b) A uniform rod AB, of length 57 cm and weight W, rests in a vertical plane at an angle of 60° with the downward vertical. A is in contact with a smooth vertical wall and B is supported by a light inextensible string BC where C is a point on the wall vertically above A. Find

(i) the tension in the string in terms of W

(ii) the length of the string correct to the nearest cm.




① $R = T\sin\alpha$

② $W = T\cos\alpha$

③ $W\left(\frac{1}{2}\sin 60°\right) = R\left(\frac{1}{2}\cos 60°\right)$

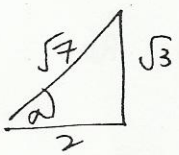
$\frac{\sqrt{3}}{2}W = R$

Contd →

① $\frac{\frac{\sqrt{3}}{2}W}{W} = \frac{T\sin\alpha}{T\cos\alpha}$

②

$\tan\alpha = \frac{\sqrt{3}}{2}$



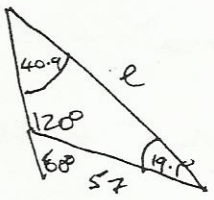

$\cos\alpha = \frac{2}{\sqrt{7}}$

$\sin\alpha = \frac{\sqrt{3}}{\sqrt{7}}$

$\therefore \alpha = 40.9°$

② $\Rightarrow W = T\left(\frac{2}{\sqrt{7}}\right)$

$\therefore T = \frac{\sqrt{7}W}{2}$




$\frac{\ell}{\sin 60°} = \frac{57}{\sin 40.9°}$

$\frac{\ell}{.8660} = \frac{57}{0.65465}$

$\ell = 75.4$

$\ell = 75$ cm (to nearest cm)