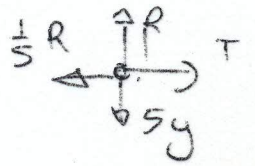
2000

Q4(a)

	5	3
accel	$\rightarrow a$	$\downarrow a$
forces	$\frac{1}{5}R$, R, T, $5g$	T, $3g$



5

NII $\updownarrow$ $R - 5g = 0$ $\qquad$ $\updownarrow$ $3a = 3g - T$ 5

$\leftrightarrow$ $5a = T - \frac{1}{5}R$

$\Rightarrow$ $\boxed{5a = T - g}$

Solving $\Rightarrow$ $a = \frac{g}{4}$ 5

System released from rest: $u = 0$, $a = \frac{g}{4}$, $t = 2$, $s = ?$

$\Rightarrow s = ut + \frac{1}{2}at^2$

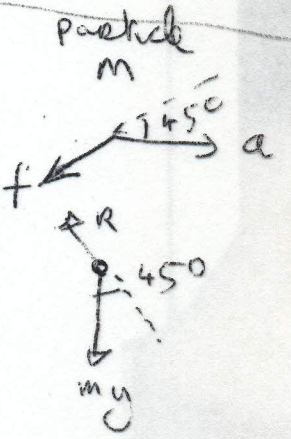
$= 0 + \frac{1}{2}\left(\frac{g}{4}\right)(2)^2$

$= \frac{1}{2}g$ metres

$= 4.9$ metres 5

4(b)(i)

	particle m	wedge $2m$
accel	$45°$, a	a
forces	f, R, $45°$, mg	$45°$, R, S, $2mg$



5

(ii)

$\perp$ wedge face:

NII $\Rightarrow$ $m(a\sin 45°) = mg\cos 45° - R$ 5

$\parallel$ wedge face:

NII $\Rightarrow$ $m(a\cos 45°) = mg\sin 45°$

Horizontal: $2ma = R\sin 45°$ 5

Vertical: $S - 2mg - R\cos 45° = 0$

Solve for a: $m\left(\frac{a}{\sqrt{2}}\right) = \frac{ma}{\sqrt{2}} - R$ and $2ma = \frac{R}{\sqrt{2}} \Rightarrow 2ma\sqrt{2} = R$

$\therefore m\left(\frac{a}{\sqrt{2}}\right) = \frac{ma}{\sqrt{2}} - 2ma\sqrt{2}$

$\Rightarrow \frac{a}{\sqrt{2}} - 2\sqrt{2}a = \frac{a}{\sqrt{2}} \Rightarrow \boxed{a = \frac{g}{5}}$