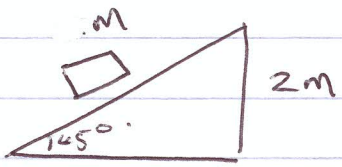
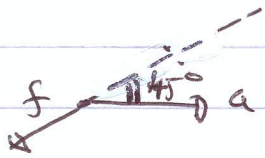
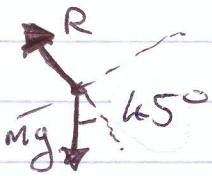
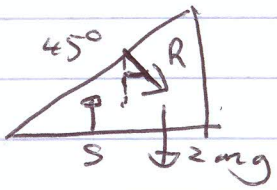
H, 1972, Q4 :



	PARTICLE	WEDGE.
MASS	m	$2m$
Accel.		
FORCES:		

N II $\perp$ to plane:

$$mg\cos 45^\circ - R = m(a\sin 45^\circ) \quad (1)$$

$\parallel$ to plane:

$$mg\sin 45^\circ = m(f - a\cos 45^\circ) \quad (2)$$

$\leftrightarrow$

$$R\sin 45^\circ = 2ma \quad (3)$$

$\updownarrow$

$$S - 2mg - R\sin 45^\circ = 0 \quad (4)$$

$(1) \Rightarrow \frac{mg}{\sqrt{2}} - R = \frac{ma}{\sqrt{2}}$

$(2) \Rightarrow \frac{mg}{\sqrt{2}} = m\left(f - \frac{a}{\sqrt{2}}\right) \Rightarrow \frac{g}{\sqrt{2}} = f - \frac{a}{\sqrt{2}}$

$(3) \Rightarrow \frac{R}{\sqrt{2}} = 2ma \Rightarrow \boxed{R = 2\sqrt{2}ma}$

[(4) Not needed]

Solve (1), (2), (3) for a and f.

$(1) \Rightarrow \frac{mg}{\sqrt{2}} - 2\sqrt{2}ma = \frac{ma}{\sqrt{2}}$

$\times\sqrt{2} \Rightarrow mg - 2(\sqrt{2})^2 ma = ma$

$\Rightarrow mg - 4ma = ma$

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

$(2) \Rightarrow \frac{g}{\sqrt{2}} = f - \left(\frac{g}{5}\right)\frac{1}{\sqrt{2}}$

$\Rightarrow \frac{g}{\sqrt{2}} + \frac{g}{\sqrt{2}\,5} = f$

$\Rightarrow \frac{g}{\sqrt{2}}\left(1 + \frac{1}{5}\right) = f$

$\Rightarrow \frac{g}{\sqrt{2}}\left(\frac{6}{5}\right) = f.$

$\Rightarrow f = \frac{g\sqrt{18}}{5}\ ms^{-2}.$

*Note $\frac{6}{\sqrt{2}} = \frac{3.(\sqrt{2})^2}{\sqrt{2}}$

$= 3\sqrt{2}$

$= \sqrt{9.2}$

$= \sqrt{18}$