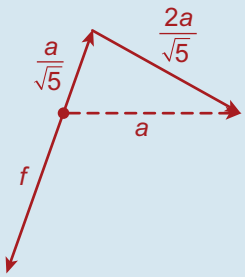
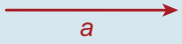
Accelerations

4*m* mass



Wedge



(ii) $4m$ particle along the plane:

$F = ma$

$\Rightarrow \frac{8mg}{\sqrt{5}} = 4m\left(f - \frac{a}{\sqrt{5}}\right)$

… multiply by $\frac{\sqrt{5}}{4m}$

$\Rightarrow 2g = f\sqrt{5} - a \quad \ldots ①$

$4m$ particle perpendicular to the plane:

$F = ma$

$\Rightarrow \frac{4mg}{\sqrt{5}} - R = 4m\left(\frac{2a}{\sqrt{5}}\right)$

… multiply by $\frac{\sqrt{5}}{4m}$

$\Rightarrow g - \frac{\sqrt{5}}{4m}R = 2a \quad \ldots ②$

Wedge horizontal: $F = ma$

$\Rightarrow \frac{2R}{\sqrt{5}} - \frac{1}{3}N = ma \quad \ldots N = mg + \frac{R}{\sqrt{5}}$

$\Rightarrow \frac{2R}{\sqrt{5}} - \frac{1}{3}\left(mg + \frac{R}{\sqrt{5}}\right) = ma$

… multiply by $3\sqrt{5}$

$\Rightarrow 6R - mg\sqrt{5} - R = 3ma\sqrt{5}$

$\Rightarrow 5R = m\sqrt{5}(3a + g)$

$\Rightarrow R = \frac{m}{\sqrt{5}}(3a + g) \ldots ③$

Putting this result into equation ② gives:

$g - \frac{\sqrt{5}}{4m}\left(\frac{m}{\sqrt{5}}(3a + g)\right) = 2a$

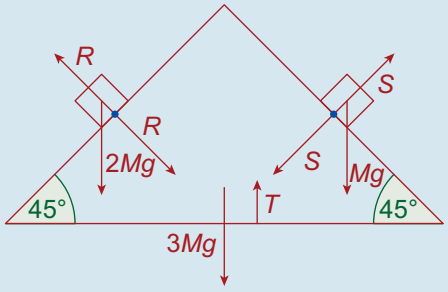
… multiply by 4

$\Rightarrow 4g - (3a + g) = 8a$

$\Rightarrow 3g = 11a$

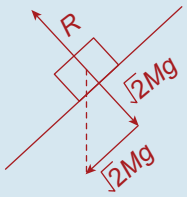
$\Rightarrow a = \frac{3g}{11}$ … acceleration of the wedge

Q. 7.

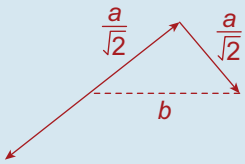


The 2*M* mass:

Forces



Acceleration



Along the plane: $\sqrt{2}Mg = 2M\left(b - \frac{a}{\sqrt{2}}\right)$

$\Rightarrow g = \sqrt{2}b - a \quad \ldots ①$

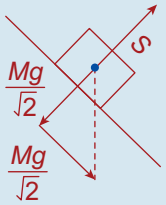
Perpendicular to the plane:

$\sqrt{2}Mg - R = 2M\left(\frac{a}{\sqrt{2}}\right)$

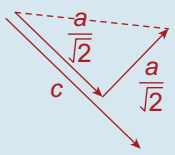
$\Rightarrow R = \sqrt{2}Mg - \sqrt{2}\,Ma \quad \ldots ②$

The *M* mass:

Forces



Accelerations



Along the plane: $\frac{Mg}{\sqrt{2}} = M\left(c + \frac{a}{\sqrt{2}}\right)$

$\Rightarrow g = \sqrt{2}\,c + a \quad \ldots ③$

Perpendicular to the plane:

$S - \frac{Mg}{\sqrt{2}} = M\left(\frac{a}{\sqrt{2}}\right)$

$\Rightarrow S = \frac{Ma}{\sqrt{2}} + \frac{Mg}{\sqrt{2}} \quad \ldots ④$