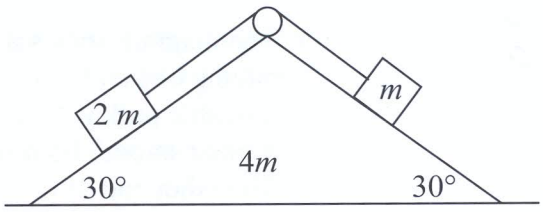
4 **(b)** Particles of mass $2m$ and m are connected by a light inextensible string which passes over a smooth pulley at the vertex of a wedge-shaped block, one particle resting on each of the smooth faces.

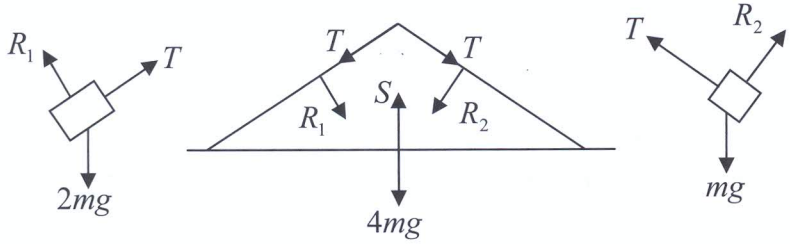


The mass of the wedge is $4m$ and the inclination of each face to the horizontal is 30°. The wedge rests on a smooth horizontal surface and the system is released from rest.

(i) Show, on separate diagrams, the forces acting on the wedge and on the particles.

(ii) Find the acceleration of the wedge.

(*i*)



5,5

(*ii*) $2m$ $\quad 2\text{mg}\cos 30 - R_1 = 2m(q \sin 30)$

m $\quad R_2 - \text{mg}\cos 30 = m(q \sin 30)$ 5

$T\cos 30 - T\cos 30 + R_1 \sin 30 - R_2 \sin 30 = 4mq$

$R_1 - R_2 = 8mq$

$\{2\text{mg}\cos 30 - 2mq \sin 30\} - \{\text{mg}\cos 30 + mq \sin 30\} = 8mq$

$mg\cos 30 = 8mq + 3mq \sin 30$

$$g\frac{\sqrt{3}}{2} = 8q + \frac{3}{2}q$$

$$\Rightarrow q = \frac{g\sqrt{3}}{19}$$ 5

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