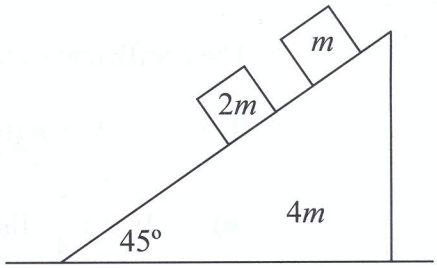
2010

4 **(b)** A smooth wedge of mass $4m$ and slope 45° rests on a smooth horizontal surface.

Particles of mass $2m$ and m are placed on the smooth inclined face of the wedge.

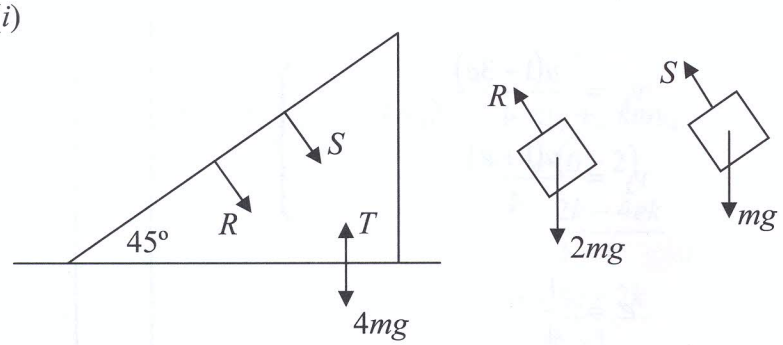
The system is released from rest.



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

(ii) Find the acceleration of the wedge.

(*i*)



5

(*ii*) $2m$ $\quad 2mg\cos 45 - R = 2mf\sin 45$

$$R = \sqrt{2}(mg - mf)$$

5

m $\quad mg\cos 45 - S = mf\sin 45$

$$S = \frac{1}{\sqrt{2}}(mg - mf)$$

5

$4m$ $\quad S\sin 45 + R\sin 45 = 4mf$

5

$$\frac{1}{2}(mg - mf) + (mg - mf) = 4mf$$

$$3mg - 3mf = 8mf$$

$$f = \frac{3g}{11} \text{ or } 2.67 \text{ m s}^{-2}$$

15

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