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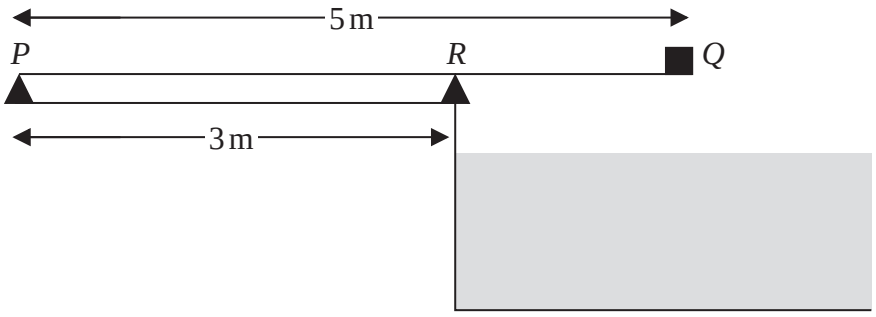

Figure 2

A boy sees a box on the end Q of a plank PQ which overhangs a swimming pool. The plank has mass 30 kg, is 5 m long and rests in a horizontal position on two bricks. The bricks are modelled as smooth supports, one acting on the rod at P and one acting on the rod at R, where $PR = 3$ m. The support at R is on the edge of the swimming pool, as shown in Figure 2. The boy has mass 40 kg and the box has mass 2.5 kg. The plank is modelled as a uniform rod and the boy and the box are modelled as particles.

The boy steps on to the plank at P and begins to walk slowly along the plank towards the box.

(a) Find the distance he can walk along the plank from P before the plank starts to tilt.

(4)

(b) State how you have used, in your working, the fact that the box is modelled as a particle.

(1)

A rock of mass M kg is placed on the plank at P. The boy is then able to walk slowly along the plank to the box at the end Q without the plank tilting. The rock is modelled as a particle.

(c) Find the smallest possible value of M.

(4)

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Q4

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