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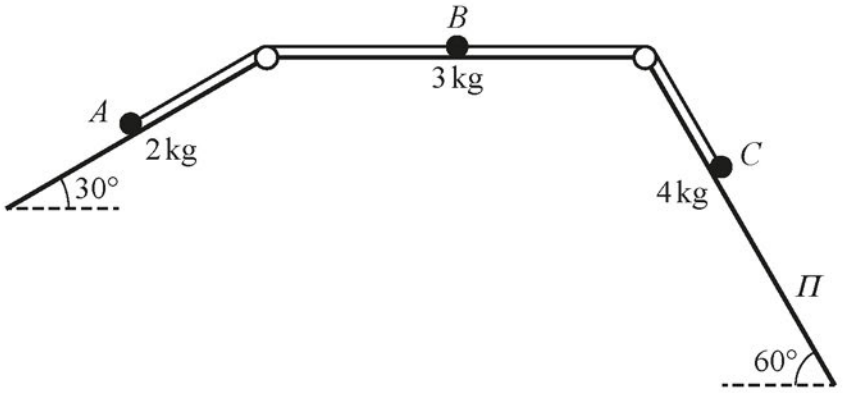

One end of a light inextensible string is attached to a particle A of mass 2 kg. The other end of the string is attached to a second particle B of mass 3 kg. Particle A is in contact with a smooth plane inclined at 30° to the horizontal and particle B is in contact with a rough horizontal plane.

A second light inextensible string is attached to B. The other end of this second string is attached to a third particle C of mass 4 kg. Particle C is in contact with a smooth plane Π inclined at an angle of 60° to the horizontal.

Both strings are taut and pass over small smooth pulleys that are at the tops of the inclined planes. The parts of the strings from A to the pulley, and from C to the pulley, are parallel to lines of greatest slope of the corresponding planes (see diagram).

The coefficient of friction between B and the horizontal plane is μ. The system is released from rest and in the subsequent motion C moves down Π with acceleration $a\,\text{m s}^{-2}$.

(a) By considering an equation involving μ, a and g show that $a < \frac{1}{9}g(2\sqrt{3}-1)$. **[7]**

(b) Given that $a = \frac{1}{9}g$, determine the magnitude of the contact force between B and the horizontal plane. Give your answer correct to **3** significant figures. **[4]**