

STEP II, 2005, Q9

- 9 Two particles, A and B , of masses m and $2m$, respectively, are placed on a line of greatest slope, ℓ , of a rough inclined plane which makes an angle of 30° with the horizontal. The coefficient of friction between A and the plane is $\frac{1}{6}\sqrt{3}$ and the coefficient of friction between B and the plane is $\frac{1}{3}\sqrt{3}$. The particles are at rest with B higher up ℓ than A and are connected by a light inextensible string which is taut. A force P is applied to B .
- (i) Show that the least magnitude of P for which the two particles move upwards along ℓ is $\frac{11}{8}\sqrt{3}mg$ and give, in this case, the direction in which P acts.
- (ii) Find the least magnitude of P for which the particles do not slip downwards along ℓ .



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