

STEP III, 2000 Q9

- 9 Two small discs of masses m and μm lie on a smooth horizontal surface. The disc of mass μm is at rest, and the disc of mass m is projected towards it with velocity \mathbf{u} . After the collision, the disc of mass μm moves in the direction given by unit vector \mathbf{n} . The collision is perfectly elastic.
- (i) Show that the speed of the disc of mass μm after the collision is $\frac{2\mathbf{u}\cdot\mathbf{n}}{1+\mu}$.
- (ii) Given that the two discs have equal kinetic energy after the collision, find an expression for the cosine of the angle between \mathbf{n} and \mathbf{u} and show that $3-\sqrt{8} \leq \mu \leq 3+\sqrt{8}$.



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