



STEP III, 2002 Q11

- 11 A particle moves on a smooth triangular horizontal surface AOB with angle $AOB = 30^\circ$. The surface is bounded by two vertical walls OA and OB and the coefficient of restitution between the particle and the walls is e , where $e < 1$. The particle, which is initially at point P on the surface and moving with velocity u_1 , strikes the wall OA at M_1 , with angle $PM_1A = \theta$, and rebounds, with velocity v_1 , to strike the wall OB at N_1 , with angle $M_1N_1B = \theta$. Find e and $\frac{v_1}{u_1}$ in terms of θ .

The motion continues, with the particle striking side OA at M_2, M_3, \dots and striking side OB at N_2, N_3, \dots . Show that, if $\theta < 60^\circ$, the particle reaches O in a finite time.



NextStepMaths.com

To view mark schemes, fully worked solutions and examiner's comments, and for more details about tutoring and other services offered, go to [NextStepMaths.com](https://www.NextStepMaths.com)