1 A particle P oscillates in simple harmonic motion between the points A and B, where $AB = 6$ m. The period of the motion is $\frac{1}{2}\pi$ s. Find the speed of P when it is 2 m from B. [3]

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2 Two uniform small smooth spheres A and B have equal radii and masses $5m$ and $2m$ respectively. Sphere A is moving with speed u on a smooth horizontal surface when it collides directly with sphere B which is moving towards it with speed $2u$. The coefficient of restitution between the spheres is e.

(i) Show that the speed of B after the collision is $\frac{1}{7}u(1 + 15e)$ and find an expression for the speed of A. [4]

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In the collision, the speed of A is halved and its direction of motion is reversed.

(ii) Find the value of e. [2]

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(iii) For this collision, find the ratio of the loss of kinetic energy of A to the loss of kinetic energy of B. [3]

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