

STEP II, 2000, Q11

- 11 The string AP has a natural length of 1.5 metres and modulus of elasticity equal to $5g$ newtons. The end A is attached to the ceiling of a room of height 2.5 metres and a particle of mass 0.5 kg is attached to the end P . The end P is released from rest at a point 0.5 metres above the floor and vertically below A . Show that the string becomes slack, but that P does not reach the ceiling.

Show also that while the string is in tension, P executes simple harmonic motion, and that the time in seconds that elapses from the instant when P is released to the instant when P first returns to its original position is

$$\left(\frac{8}{3g}\right)^{\frac{1}{2}} + \left(\frac{3}{5g}\right)^{\frac{1}{2}} (\pi - \arccos(3/7)).$$

[Note that $\arccos x$ is another notation for $\cos^{-1} x$.]



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)



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)