

STEP III, 2012 Q10 MS

10. After motion commences, the next at rest position has the string at $\frac{\pi}{3}$ to the vertical.

Conserving energy between the two at rest positions gives $\lambda = 3mg$. Conserving energy for the general position and resolving radially, bearing in mind that the angle of the radius to the vertical is twice the angle of the string to the vertical, and using a double angle formula gives the required result. The discriminant being negative or completing the square demonstrates that the reaction force is always positive.



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)