

## Answer to Question #70007, Physics / Mechanics | Relativity

### Question:

A particle of mass  $2m$  is connected by an inextensible string of length  $1.2m$  to a ring of mass  $m$  which is free to slide on a horizontal smooth rod. Initially the ring and particles are at same level with string taut. Both are then released simultaneously. The distance in meters moved by the ring when the string becomes vertical is??

### Solution:

First of all one should consider that there is no outer force acting on the system in horizontal direction. Indeed, there is no friction acting on the ring, and the gravitational force acting on the particle is acting vertically. The force of tension in the string is the inner force in the system. In this case the center of mass of the system cannot move horizontally. Initially the center can be found as

$$mx = (1.2 - x) * 2m$$

$$mx = 2.4m - 2mx$$

$$x = \frac{2.4}{3} = 0.8 (m)$$

where  $x$  is a distance from the distance from the initial position of the ring.

When the string is vertical both masses are at the same vertical line, and so is the center of mass of the system.

This means that the ring had traveled

$$x = 0.8 (m)$$

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