Question #135

This week's question is a two-part follow-up to Questions of the Week #119 and #123.

A mass $M$ on a level air track is connected by a string passing over a pulley to a much smaller mass $m<<M$, as seen in the photograph at the left below.

Releasing $M$ allows $m$ to accelerate it along the air track. The timer measures the time taken for a flag on the top of the air track glider to travel from photocell gate "A" to gate "B," which turns out to be exactly 2.00 seconds. See a video of the action by clicking your mouse on the photograph above.

Part 1:

Suppose that the same experiment is performed with both mass $m$ increased to $2m$ and mass $M$ increased to $2M$, as seen in the photograph at the center above. How long will the glider take to travel from photocell gate "A" to gate "B"?

The time taken for mass $2m$ to accelerate mass $2M$ a distance of $D$ from A to B will be:

- (a) 4 seconds.
- (b) 2.83 seconds
Part 2:

Now suppose that the same experiment is performed with mass $M$ increased to $2M$ and distance $D$ decreased to $D/2$, as seen in the photograph at the right above. How long will the glider take to travel from photocell gate "A" to gate "B"?

The time taken for mass $m$ to accelerate mass $2M$ a distance of $D/2$ from A to B will be:

- (a) 4 seconds.
- (b) 2.83 seconds
- (c) 2 seconds (the same).
- (d) 1.41 seconds.
- (e) 1 second.

Click here for Answer #135 after January 20, 2003.