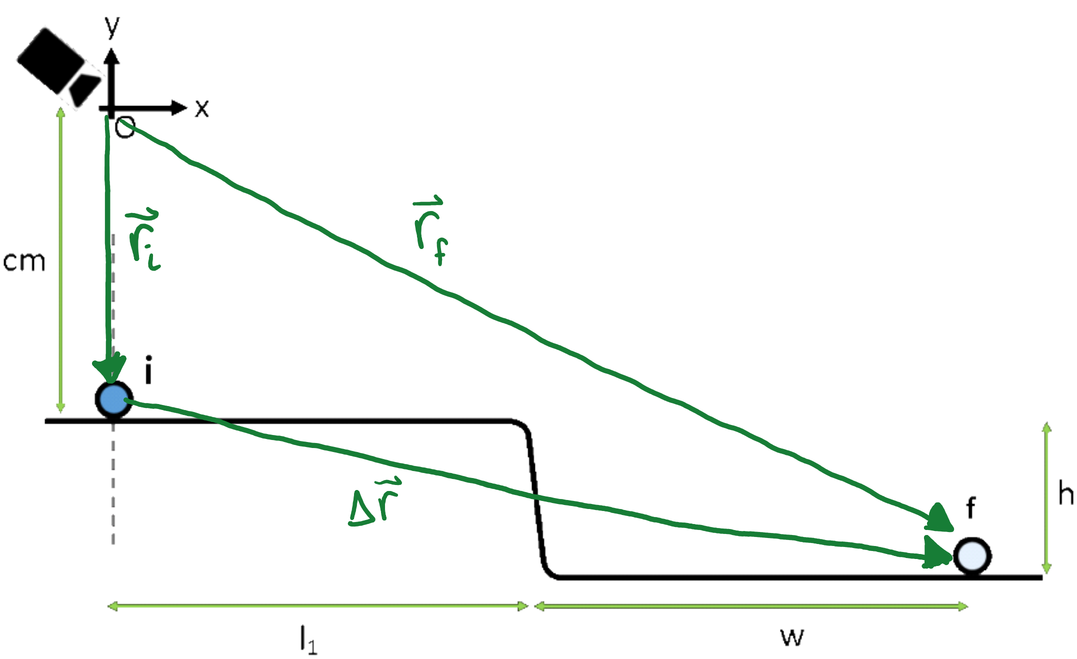
Individual Quizbit 1 | Solution

Sunday, October 9, 2022 7:33 PM

(a) eq. $v = \frac{x}{t}$ b/c consistent dimensions, $\frac{[L]}{[T]}$

$$\Delta t_{l_1} = \frac{l_1}{v_1} = \frac{1.10\,m}{0.075\,m/s} \Rightarrow \Delta t_{l_1} = 14.\bar{6}\,s$$

(b)



(c) $\vec{r}_i = \langle 0, -0.9 \rangle m$, $\vec{r}_f = \langle l_1 + w, -0.9m - h \rangle = \langle 2.2, -1.3 \rangle m$

$\Delta\vec{r} = \vec{r}_f - \vec{r}_i = \langle 2.2 - 0, -1.3 - (-0.9) \rangle m = \langle 2.2, -0.4 \rangle m$

(d) No, $\Delta t_{l_1} \neq \Delta t_w$ b/c the ball rolls down hill and speeds up w/ $\Delta t = \frac{x}{v}$ + $l_1 = w$, but $v_{l_1} < v_w$, $\Delta t_{l_1} > \Delta t_w$

Group Quizbit 1 | Solution

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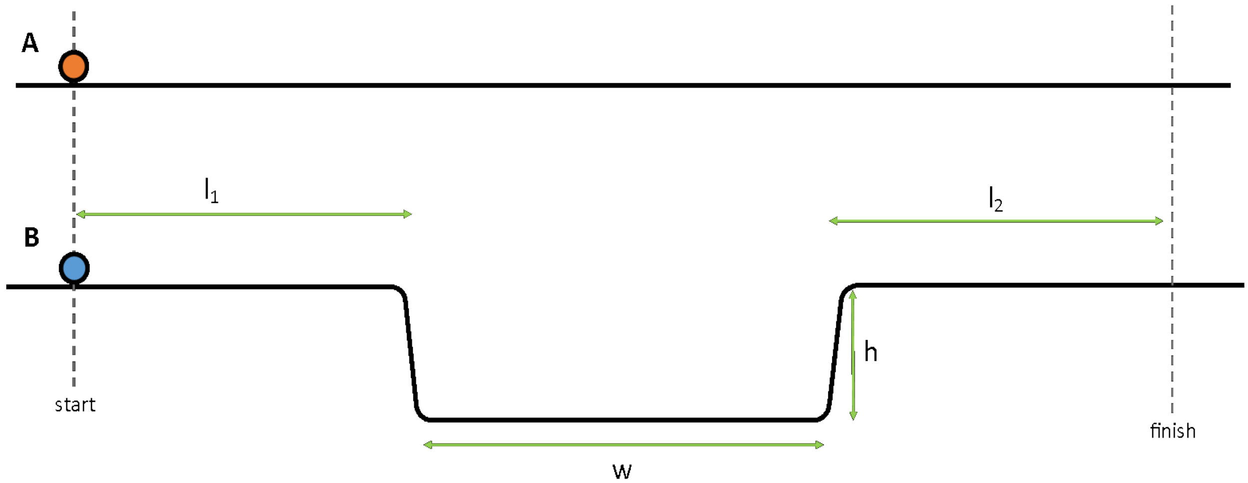

(a) The equation that connects speed, distance, and time when something **is not accelerating** is v = x/t. Ball A and ball B both travel the **same distance with the same speed**. Therefore they must take the **same amount of time**. This portion of track does not affect who wins the race.

(b) Similarly to part (a), the problem statement says **ball B will be traveling the same speed as ball A** while going through l_2. If they are both going the same speed, for the **same distance**, at least for that section of track, they take the **same amount of time**. This portion of track does not affect who wins the race.

(c) The conundrum here is that ball B travels a **longer distance by 2h** - the distance to go down the dip and back up - **but it's traveling at a faster pace while in the dip**. For the extreme case where h >> w, it travels a much longer distance than A. If it's deep enough, ball A will have reached the finish line by the time ball B even gets to the bottom of the dip. So for this extreme case, I would be plausible for ball A to win the race.

(d) Now we have the opposite feature of part (c). With h << w, it **adds much less time** going down and back up, but it has the **benefit of going faster** through the middle part of the track. For this special case, it seems that covering the distance w fastest, **could make up for the extra time going 2h**. I think it's plausible ball B wins the race.

(e) Comparing the special extreme cases in part (b) and part (c) shows that you get **different answers depending on the ratio of h to w**. It's plausible there is a perfect ratio h/w where they both finish at the same time. We would have to know that ratio to truly find an answer. Oh yeah, and friction would add some complexity.