

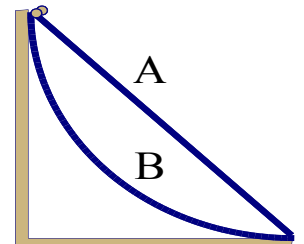
Scientists ask questions and look for answers. Demonstrations provide wonderful opportunities to students for asking questions

Students love demos. Teachers love demos. Unfortunately after having seen a demo most students fail to recall what the point of it was. Demos can be very effective teaching tools but we must ensure that conceptual understanding is gained through a series of guided questions. ( Please see Mazur's article on demonstrations for evidence )

**Demo:** Which marble wins the race?

**Equipment:** A curved and a straight track which start and finish at the same height ( see diagram at the right)

**Concepts:** Speed, Acceleration, Distance, Displacement, Time and Energy ( Not all need to be discussed)



Prior to doing the demonstration and prior to asking the students for their predictions first ask the students to list at least two important characteristics the two tracks have in common and two important characteristics things the two tracks have that are different. They should write these down

Things in common ( track)

- 1.
- 2.

Things different (track)

- 1.
- 2.

They should then do the same for the predicted motions

Things in common ( motion)

- 1.
- 2.

Things that are different ( motion )

- 1.
- 2.

Students then need to pick one of the following three answers

- a) marble on track A is first
- b) marble on track B is first
- c) marbles on both tracks finish at the same time

This can be done with a show of hands or better still with concept question answer cards\*

After they have committed to an answer the marbles should be released ( they move quickly so you may have to do this several times )

The merits of each of the answers should be discussed i.e.

Answer A: Track A is the shortest distance

Answer C: Both marbles start and finish with the same speed both fall the same distance and have the same horizontal displacement

The best answer should then be explained by the students rather than the teacher .

The ball on the curved track reaches a greater speed sooner ( greater initial acceleration) and thus travels the distance in a lesser time

\* A set of 5 or more single letter answer cards that the students can hold up to show their responses