The Big BB Race [Activity]

The purpose of this activity is to demonstrate the independence of the horizontal and vertical motion of a projectile. This activity should inspire some lively in-class discussion prior to the demonstration. Students should be allowed to argue for an incorrect outcome. The teacher must keep a strict poker face throughout the discussion phase so as to let all lines of reasoning be explored. All this makes for a dramatic and memorable conclusion!

Answers to Procedure Questions

1. Sketches will vary; all projectile paths should start at the launch point and end at the impact point.
2. Arguments will vary.
   Student X: The dropped ball falls straight down; the launched ball travels forward, delaying its arrival on the ground.
   Student Y: The launched ball was given a high speed upon launch, so it will travel faster and reach the ground first.
   Student Z: Both will fall downward at the same rate regardless of their horizontal motion. "Gravity affects both the same way."
3. Responses will vary. Some things students might suggest:
   "No-fall distance" is increased by greater launch speed or launch force
   "No-fall distance" is decreased by air resistance or weight of the projectile.
6. It's a tie!

Answers to Summing Up Questions

1. The horizontal motion of the launched ball has no effect on its vertical motion
2. There is no no-fall distance! Both balls begin to fall simultaneously—right when they're launched.
3. Both would hit the ground at the same time—horizontal motion and vertical motion are independent!