

**CONCEPTUAL PHYSICS****Activity***5.5 Projectile Motion: Projectiles Launched Horizontally*

THE BIG BB RACE

Purpose

In this activity, you will compare the path of a projectile launched horizontally with that of an object in free fall.

Required Equipment and Supplies

simultaneous launcher / dropper

Discussion

Suppose a ball bearing (BB) were launched horizontally at the same time another BB were dropped from the same height. Which one would reach the ground first?

Procedure

Step 1: Draw the path you think the launched projectile will take on Figure 1. That is, draw a line connecting the launch point and the impact point in the diagram that traces the path you think the BB will follow.

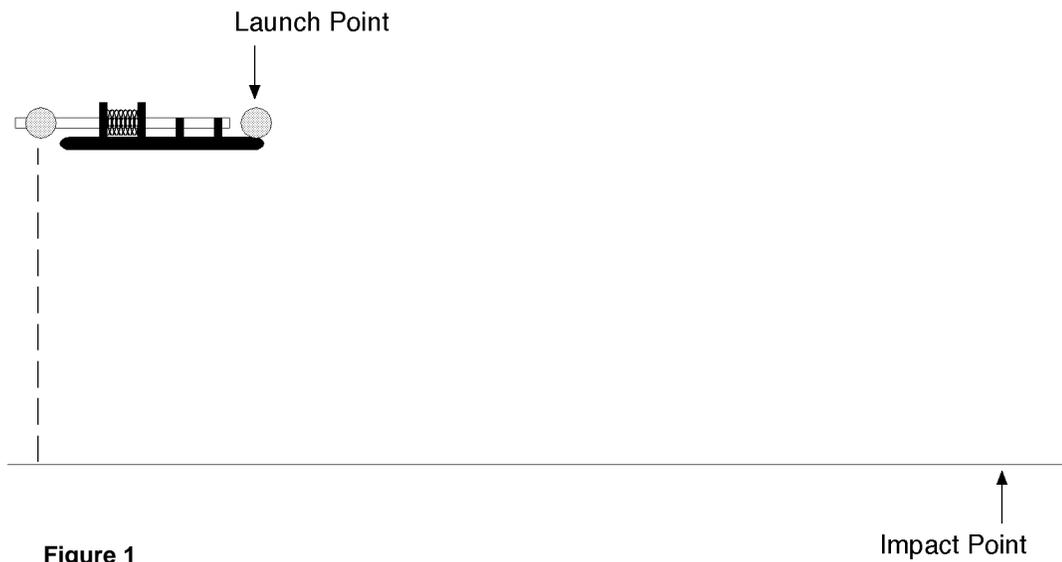


Figure 1

Impact Point

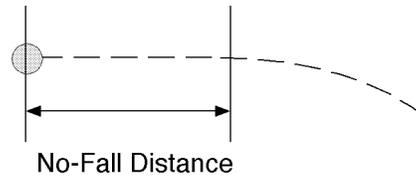
Step 2: Consider the predictions of three students. Write arguments supporting each prediction (whether you agree with the prediction or not).

Student X predicts the dropped BB will hit first. Why might Student X believe this?

Student Y predicts the fired BB will hit first. Why might Student Y believe this?

Student Z predicts both balls will hit at the same time. Why might Student Z believe this?

Step 3: One of the reasons sometimes offered to support the prediction that the dropped ball will hit first is that the launched ball will travel forward for some distance before starting to move downward. What factors might determine the length of this “no-fall distance,” as shown in Figure 2?



Step 4: Which prediction do you agree with: dropped ball hits first, fired ball hits first, or both hit at the same time?

Step 5: Observe the operation of the simultaneous launch/drop mechanism.

- Observe a dropped BB.
- Observe a launched BB.
- Observe The Big BB Race: a simultaneous launch *and* drop.

Step 6: Which BB hit the ground first, or was it a tie?

Summing Up

- How does the horizontal motion of a projectile affect the vertical motion of the projectile? In other words, does the horizontal motion of the projectile make it move faster or slower in the vertical direction (or does it have no effect)?

- Which factors—if any—appear to have the greatest effect on the no-fall distance discussed above?

- If the launched BB had a rocket engine propelling it forward after it was launched, what—if anything—would have been different about the outcome of The Big BB Race?
