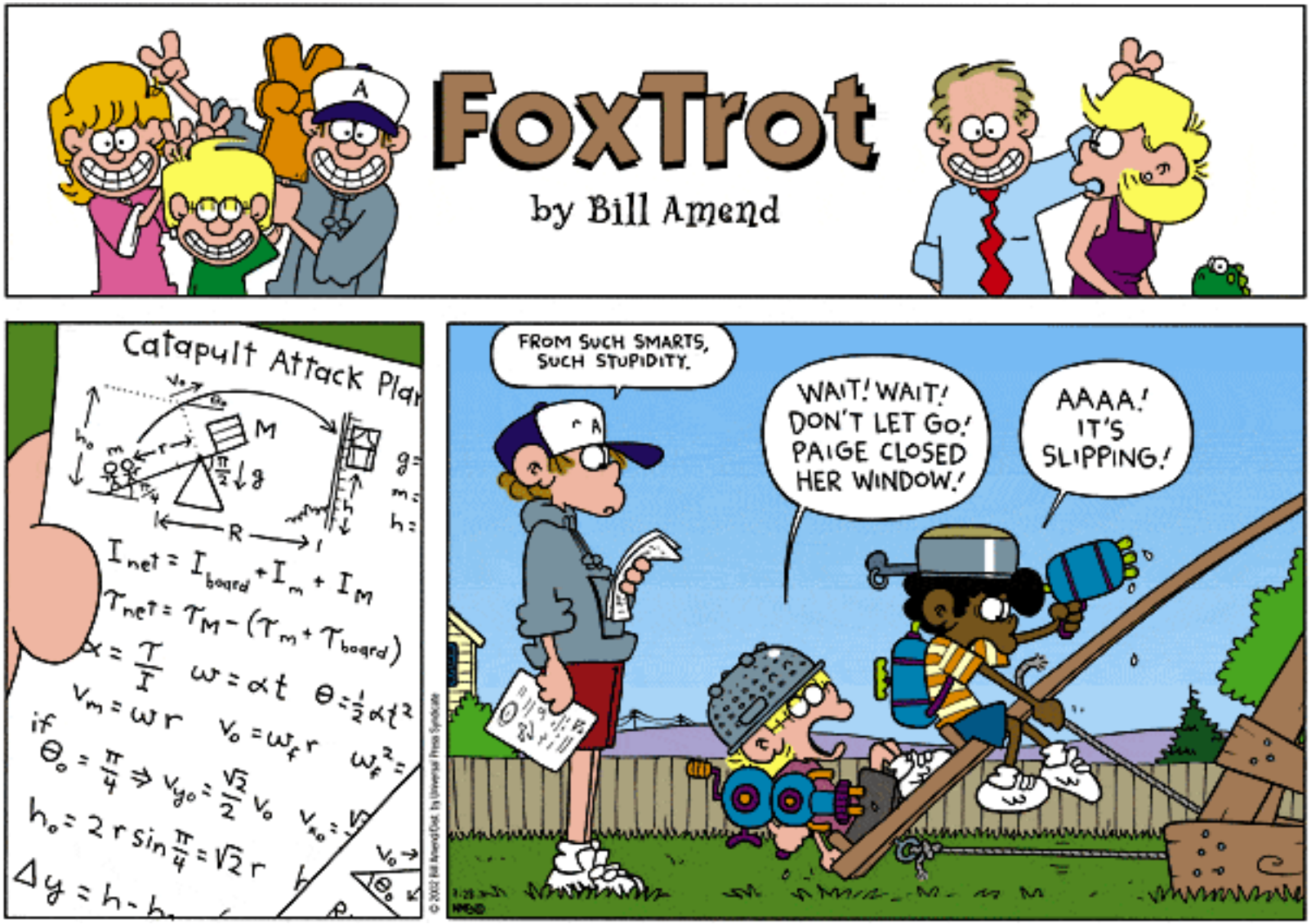
Topics Today: Projectile Motion



COLLOQUIUM
October 9th, 2014
4:10 p.m., Room 1415 BPS Bldg.
Department of Physics and Astronomy

Dr. Eric Brewe
Florida International University

--Engaging Students in Modeling Instruction--

Abstract:
Teachers tend to teach as they were taught. From this perspective the introductory physics course is of primary concern in the preparation of physics teachers. Modeling Instruction is an active learning strategy built on the premise that science proceeds through the iterative process of model construction, development, deployment and revision. We describe the role that participating in 'authentic' modeling has in learning and then explore how students engage in this process in the classroom. In this presentation we provide a theoretical background on models and modeling and describe how these theoretical elements are enacted in the introductory university physics classroom. We provide both quantitative and video data to link the development of a conceptual model to the design of the learning environment and to student outcomes.

We're only going to get through Ch 8 today – what should we do about the homework?

Make the current Ch 8 due on Monday the 20th; keep Ch 9 & 10 due next Friday …I will shorten the number of problems on Ch 9's homework

Have you gotten a personal response from me on a reading question this semester?

A. Yes
B. No
C. You respond to those???

Announcements

- LON-CAPA ch8 RQ's. I've graded for points, but I sorry no responses this time around.
- "Satellite Ranking" problem was grading incorrectly; I've fixed it.
  - If you submitted before yesterday at 2pm then I reset all your submissions; try it again.
- Exam 2 is on Monday Oct 27th
  - Will cover material from Ch 6 – 10 (excluding rotational motion parts of Ch 8 & 9)

Reflections on MidSem Survey

- People who commented on reading questions only had positive things to say
  - They help you know what to focus on, and help you study important ideas for the exam → Great! ☺
- In-class time: 2 strikingly different opinions
  - 30% of responders identified the conceptual clicker questions, whiteboard problems, and spending time understanding different ways of thinking to be an important part of what helps them learn
  - 40% of responders identified example problems, working through calculations, and lecturing to be important parts of what helps them learn

Reflections on MidSem Survey

- I highly value building logical arguments, justifying your reasoning, and evaluating other people's arguments as building scientific literacy
- I also know that for folks who are struggling with reasoning hearing both correct and incorrect pathways can help them figure out their own misunderstandings

→So I don't want to cut out the discussion parts of class

→I will (am?) try to cut back the length of time we spend on a single question

→I have also been incorporating more calculation parts into what I write down in class

→Keep in mind that the exams highly value the argument part not just the correct calculation

Projectile Motion

- http://www.youtube.com/watch?v=3wAjpMP5eyo

  Is it real?

  A. Yes
  B. No

Galileo

- A horizontal velocity does not affect the way and object falls
- The fact that an object is falling does not affect it's horizontal velocity

3 importance algebraic relationships:

$V_f = v_0 + at$

$\Delta x = v_0 t + \frac{1}{2} at^2$

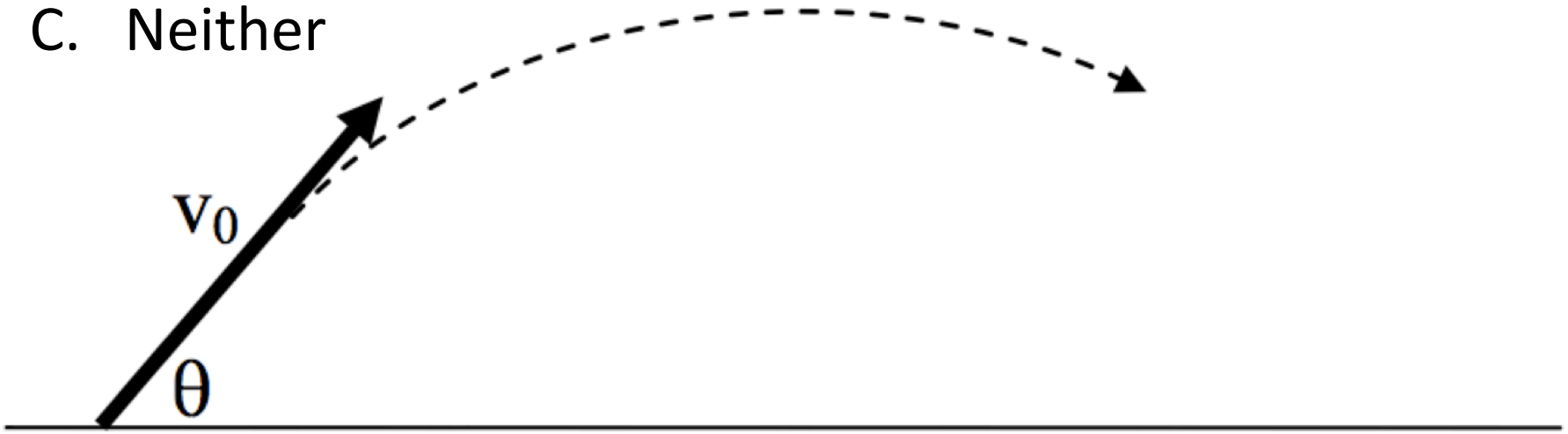
$(V_f)^2 = (v_0)^2 + 2a \Delta x$

RQ: There are a lot of equations in this chapter can you help me organize them so that I can know what to focus on?

An alternative way to think of this using vector algebra is on the YouTube channel

A projectile is fired at an angle θ (above the horizontal) with an initial **speed** v0. What is the x- component of the velocity vector?

A. $V_o \cos\Theta$
B. $v_o \sin\Theta$
C. Neither



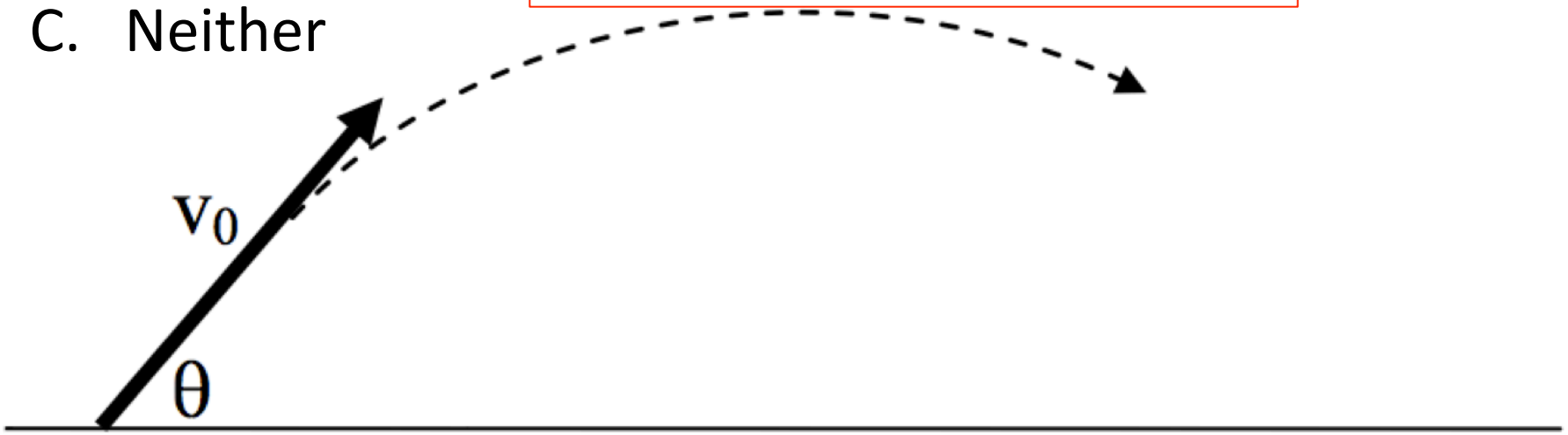
A projectile is fired at an angle θ (above the horizontal) with an initial **speed** v0. What is the x- component of the velocity vector?

A. $V_o \cos\Theta$

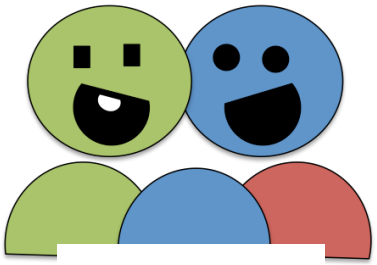
B. $v_o \sin\Theta$

C. Neither

The x-component (or horizontal component) is the adjacent side to the angle, so the horizontal component is related to v_0 by cos(theta)

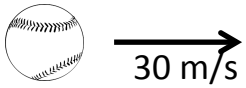


The six balls, of different mass, below are thrown horizontally at different speeds from the same height above the ground. Assume effects of air resistance are negligible. Rank the balls based on (1) the time they spend in the air, and (2) the horizontal distance they travel before hitting the ground.



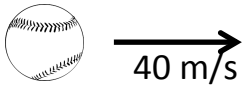
Discuss It!

A



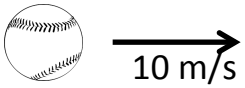
1.0kg

B



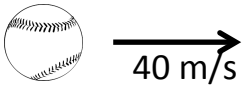
1.0kg

C



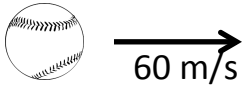
.5kg

D



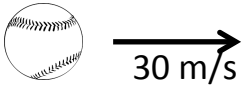
.5kg

E



.3kg

F



.5kg

Ranked in terms of time in the air

A. E>F=D=C>A=B
B. E>B=D>F=A>C
C. E>D>B>F>A>C
D. They are all equal
E. Something else

Ranked in terms of time in the air

A. E>F=D=C>A=B
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E. Something else

The only acceleration is in the y-direction, and the initial velocity is only in the x-direction, so the time in the air is dictated only by the height.

The mass doesn't matter because the FBD shows in the y-direction mg = ma, so the masses cancel out.

Ranked in terms of distance traveled

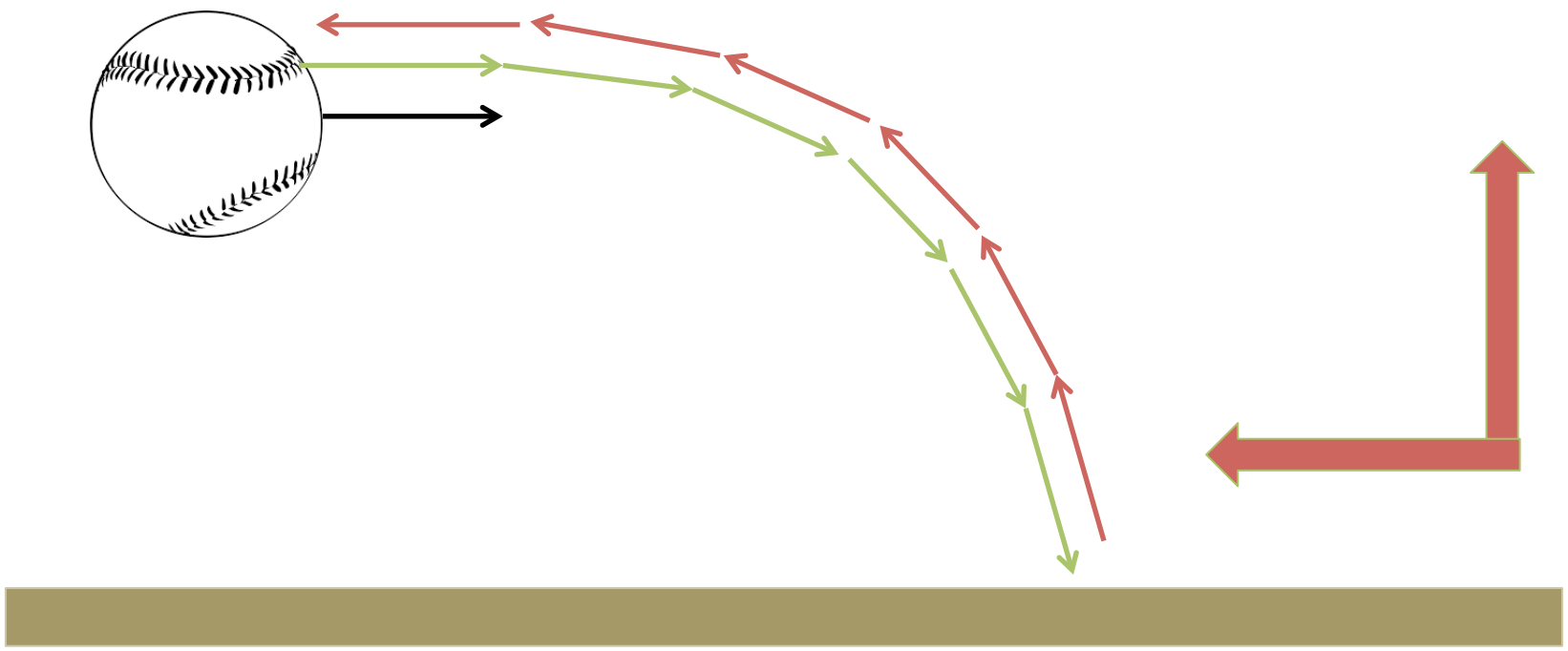
A. E>F=D=C>A=B
B. E>B=D>F=A>C
C. E>D>B>F>A>C
D. They are all equal
E. Something else

Ranked in terms of distance traveled

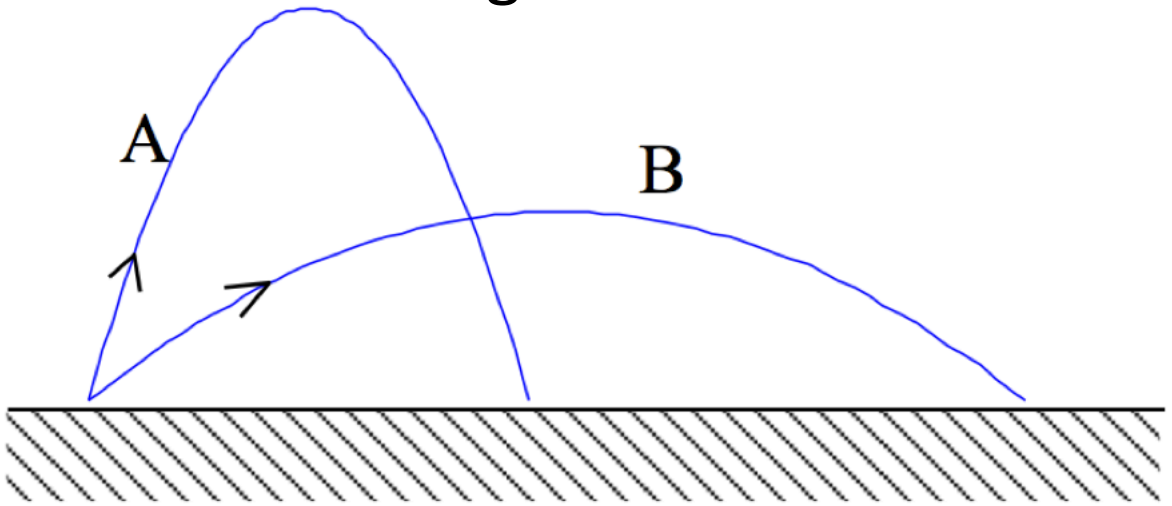
A. E>F=D=C>A=B
B. E>B=D>F=A>C
C. E>D>B>F>A>C
D. They are all equal
E. Something else

Because the times are all the same, and the acceleration in the x-direction is 0, the only thing that determines the horizontal distance traveled is the initial velocity in the horizontal direction.

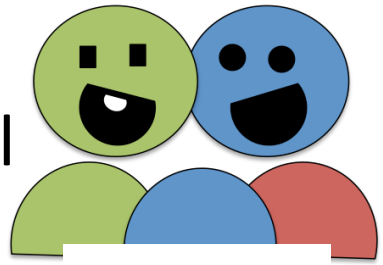
Air Resistance



Two projectiles are fired from a cannon. For projectile A, the cannon is tilted upward at an angle twice that of projectile B. Both projectiles are fired with the same initial speed. (Neglect air resistance.) Which projectile was in the air longest?



A. A
B. B
C. A and B were in the air for the same length of time
D. Not enough information to tell



A projectile is fired at an angle θ with an initial speed v0 from a table that is a height h above the floor. You want to determine the time of flight.

Work with folks around you to determine the appropriate kinematic equation to start this problem.