Introduction to Tutorials

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And all the lecturers

Structure of Tutorial Sessions

- August 12: Break up into groups and receive problem sets, pick your challenge!
- August 12, 13, 15, 18: solve problems, prepare presentations
- August 20, 21: Present your answers as a group (10 minutes+ question time, 8 groups/day to present)
- August 21 Fabulous prizes presented for “best” answers at the school banquet

Categories of Competition

- Outstanding Pedagogy
- Most prolific (yet accurate) Responses
- Most Unexpected (but plausibly correct) Answer

How to pick the questions you'll answer

- Please try to answer at least one "open" and one "closed" questions:
  - Open questions: ones with many possible good answers (i.e. Design an experiment to do x)
  - Closed questions: questions with only 1 answer: "show that if x and y, then z".
- Try to answer at least one experimental and one theoretical question
- Answer as many questions as you have time to answer
- Pick one and only one question to present at the end
- Everyone in group has to present

Breakdown of Questions

- 35 Questions in total

- Closed: 1-7,9,10,14-18,20-23,29-33
- Open: 8,11,12,13,19,26, 27, 28, 34, 35

- Theory: 1-7, 29-34, 9, 14, 15
- Experiment: 8 (asked by a theorist), 10-12, 13, 16-23, 19-28, 35

Tutorial Question #99
How fast is a golf swing? How much power goes into hitting a golf ball?

Deborah Harris

Fermilab

State the question
Give your names and institutions
Don't be afraid to answer a question on a subject about which you knew nothing before this school

Assumptions

- Assume a golfer's arm is 0.8m long
- Assume a golf club is 1.1m long
- Assume the swing takes 0.1 second to complete
- Assume ball weighs 46 grams

List the assumptions you make to answer the questions

Calculations

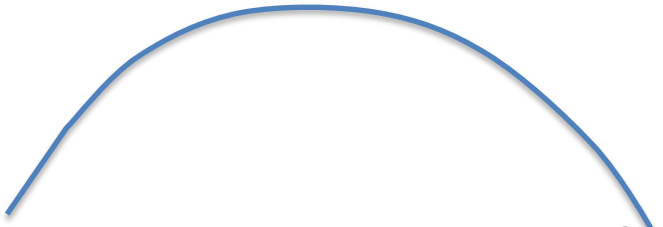
- Speed for "lower π of swing" at contact if it were constant:
  - speed of club= πr/0.1 second
  - 6m/0.1sec = 200km/hour
- Energy of golf ball at contact:
  - ½mv^2= 0.5*.043kg*4e10m/3.6e3 seconds=2.3e5J
- Power given to ball: assume energy is transmitted in that 0.1 second: 2.3e6J/sec
- 2.3MW power

Don't need to show all your math
Give answer to 1 or 2 significant figures

Wonder how far that ball would go if there were no air friction…

- Initial speed: 60m/sec
- For longest distance, assume ball was hit at 45 degrees w/rt the horizontal
- High school physics and algebra not shown…
  - Initial Energy: $\frac{1}{2} mv_0^2$
  - Energy at maximum height h: $\frac{1}{2} mv_0^2 \cos(45)+mgh$
  - Total distance: 2 times horizontal distance at max height
  - Answer: 250m

Extend the problem if you like!



How far do you need to hit the ball?

- Old Course at St. Andrews:
  - 6721 yards, par 72
  - http://www.standrews.com/Play/Courses/Old-Course
  - This means that the average shot could be less than 100m
  - Friction might play a bigger role here than I naively assumed.

Cite your sources, conclude with what you learned

Goals of Tutorial Sessions

- Give you a chance to apply what you're learning at the school
- Get you to meet other students who you haven't met before
  - Look around you: these are your future collaborators, why not start now?
- Practice your presentation skills
- Have fun!

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