Query Paper / Inquiry Paper Description and Grading Rubric
FYSE 130 -- Physics of Sport
Fall 2014

Throughout this semester, you are tasked to complete 2 "inquiry papers" (the first as a member of a group, the second individually). This document outlines the goals, expectations, and grading criteria for these papers.

Rationale:

The main goal of our course is to develop critical thinking and problem solving skills. To demonstrate your mastery of these skills, you will be assigned questions associated with the course topic – the physics of sports – that you will answer. Your principle goal in constructing your responses to these questions is to establish your capabilities in regards to critical thinking and problem solving – I care far more about the internal logical consistency and thought process that go into your solution method than in the accuracy of your final answer.

These papers are *not* research papers; the goal here isn't to learn how to find information in a library or to cite things appropriately. Many of the questions you are assigned have answers that can be found – either in library resources or on the internet – with reasonably little effort. An accurate answer without a well-reasoned, logical justification will receive far less credit than an inaccurate but well-reasoned answer. It is expected that the thought process presented is ultimately your own.

Format / Details:

These papers should be long enough to summarize the question, supply relevant background information, outline a solution methodology, and comment on uncertainties associated with your answer. Although there is no formal length requirement, I would find it surprising if you could accomplish these tasks well in less than 3 pages.

Your papers should be typed and turned in at the beginning of class on the due date. Any late papers will be penalized 20% for every 24 hours late. (e.g. 1 minute – 24 hours late, the best possible score will be an 80%. 24 hours and 1 minute to 48 hours late, the best possible score will be a 60%, etc.) You have the due-dates far in advance of the actual due-date. I would recommend preparing your papers well in advance so that a last-minute interruption will not prevent you from finishing your work on time. Since you were given the due dates for this assignment on the first day of the semester, no excuses for late work will be accepted. If you are unable to attend class on the due date, send an electronic copy of your work to LarsenML@cofc.edu **before** the paper is due and it may be accepted at the instructor's discretion.

The expected general format for both of these papers should progress as follows:

Title
Author Name(s)
Date
Report Number

Problem Description: This section should outline the basic nature of the question being addressed. Any details to explain the scenario in question should be clearly given. If the question is associated with a particular sport or a particular context within the competition, all *relevant* details that may influence the discussion should be presented. The length of this section may vary somewhat based on the question, but will probably normally be at least a decent-sized paragraph and could possibly extend to a full page or more.

Outline of Suggested Solution: This is the bulk of your paper. In this section, you are tasked to present a logical argument attempting to definitively answer the question. It is okay if you have to make simplifying assumptions, but (1) clearly identify any simplifying assumptions you have to make, and (2) justify your assumptions if they are at all questionable or potentially objectionable. If you need to go to an external source (e.g. Google, sport rule-book, classmate, or instructor) to obtain extra information, that is okay – but please clearly indicate where the information was obtained.

The argument you make, as well as the solution you give, should be logically self-consistent, address the problem as posed in the problem description, and should be able to stand up to critical scrutiny. All steps in the logical sequence should coherently build on previous steps given. Any physical laws invoked/used or introduced should be accurately depicted.

Again, this suggested solution is the heart of your paper. This section should be at least 1 page, and possibly up to 3 pages of your paper.

Commentary / Extensions of Suggested Solution: Most solutions that you will present will likely make simplifying assumptions that may possibly be objectionable. (For example, when examining the flight of a baseball in class, we originally modeled the path of a baseball as the hypotenuse of a right triangle when, in reality, it is better described by a parabola and – when air resistance is taken into account -- is better still described by an even more complicated geometric figure). In this section, you are asked to refine your solution by taking these complications into account *OR* make a compelling argument as to why these complications would not change your answer appreciably.

This section is an appropriate place to include other commentary that suggests that you've thought about this problem in some detail and to introduce other questions that answering this question inspired. (You need not answer these other questions.) This area of the paper is your opportunity to impress me and

demonstrate that you've given this question some serious thought. You may also (briefly) describe other solution methods that you think may be fruitful, though you should not describe these in as much detail as your main solution method presented in the previous section.

This section may be anywhere from a few paragraphs to 1-2 pages.

Confidence Estimation: Many of your questions ultimately will result in developing a numerical estimate of some parameter. When appropriate, this section is to be used to carefully describe the confidence range you have in your answer. For example, if you are estimating how fast a human being could possibly run the 100 meter dash, your answer may end up being something like "I am aware that the world record for the 100 meter dash is nominally 9.58 seconds. After the argument above, I believe I have made a compelling case to support that it would be physically possible to complete the dash in 9.10 seconds. However, based on the assumptions I made, I feel very confident that no human could run the 100 meter dash in any time shorter than 8.1 seconds; a speed this fast would require a sustained speed matching the fastest instantaneous speed ever recorded for a human to date over the entire 100 meter course." You should give some reasoning to justify your estimated range, though this can be done – as shown above – in as little as one sentence.

Historically, students struggle with this section – but it is *very* important. Science inquiries seldom give definitive answers, and effectively communicating ambiguous or uncertain results is an important skill to develop. If you need assistance understanding what is expected in this section (or anywhere else in your paper), please come see me! That's what I'm here for.

Grading Rubric

These papers will be graded using the following rubric. Please pay careful attention to any comments that accompany your paper explaining any weaknesses.

Format / Style / Organization (20%)
Paper is organized in the manner requested above. Paper is of appropriate length.

Problem Description (15%)
Nature of problem/question is clearly conveyed to the reader. Enough detail is given to characterize the specific problem addressed.

Outline of Suggested Solution (25%)
Solution method outlined is presented clearly. Argument contains no logical inconsistencies, and subsequent steps naturally follow from previous steps in the process. Reader can clearly understand steps taken by writer to solve problem.

Commentary/Extensions (20%)
Clearly organized and coherent description of side-issues associated with problem. Writing clearly identifies any major sticking-points to the main argument and addresses them in a logically consistent and understandable way. Writer establishes interesting directions for future inquiries brought up by this question.

Confidence Estimation (10%)
Final answer to the question is reasonable (it passes any "sanity checks"), and bounds around numerical estimates are justified and reasonable.

General Impression (10%)
A subjective category based on your instructor's evaluation of the quality of the technique used and critical thinking skills applied to the problem.