Foundations of Physics Workshop

Research Exercise 1

A typical first service by a male *Grand Slam* tennis player reaches over 200km/hr. In this exercise, you'll compare the energy of projectiles in various sports using information gathered from online sources.

Research Question: How does the kinetic energy of the tennis in this case compare with the kinetic energy of any of the following (example) sports balls: cricket; golf; soccer; AFL; hockey; baseball? You may, of course, be able to think of others.

Choose a sport where an object (typically a ball) is propelled (with or without the aid of some kind of 'hitting stick') by human effort and restrict yourself to first-time hits, throws or bowls.

For this task you're going to need to tabulate values for the mass, m, and velocity v of the ball, which you should source from reputable sources. Consider only the first throw or hit. Consult internet resources for suitable numbers.

Procedure:

(i) Make a table of the values for m, v and k.e for each of the sports you select (choose at least three). For the values of m and v, make sure you note where your source (e.g. the URL). It's common practice to use results from others, but you do have to be able to say exactly where it came from.

(ii) Add an appraisal of the quality of your data source.

(iii) Comment on your results in your journal.

(iv) Prepare a slide to summarise your results to the class.

Task 2: Group problem solving

The problems below are examples of applications of the material covered in the lectures.

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Research Exercise 2

You have a box/bag with several different balls, some string and some measuring instruments. In this exercise you'll test whether the balls satisfy the requirements of the relevant sporting codes.

Use your practical skills to

(i) Come up with a measured value for the diameter of the ball and compare it with a 'reference' value you determine through research.
(ii) Compute the amount of energy lost in each bounce of the different balls and compare the answers you get with any reference values you can find.
(iii) Prepare a slide that summarises your findings and prepare to summarise to the class.

Suggestions:

Use Internet sources to determine the ideal characteristics of the sports balls you have. If you have two balls for the same sport in your bag, they may be of different standards (e.g. squash balls) or price (tennis and table tennis).

As with the first research exercise, document the sources of your information and grade it according to reliability.

Use the string, your own ruler and/or the video capabilities of your phone to determine whether the balls provided satisfy the requirements for the sport in question for:

(i) Size (place uncertainty limits on your answer)
(ii) Bounce-ability

Task 4: Mini test, peer marked.