QRMS Project 1: Energy Use (Due October 10, 2011)

In this project, you'll investigate your energy usage and the effect of conservation strategies. The first part should be done individually, but you may work in a group of up to three people in the second part.

Part 1: Energy Audit (15 pts)

This portion should be done individually by all group members before proceeding to Part 2. Your results from this part of the project may be hand-written (although typed is better) and should be handed in separately from the group portion of this project. Be sure that the data is presented clearly and show your work in the calculations.

1. Estimate how many kilowatt-hours of energy you use in a month by performing an "audit" of your living area.
   Hints:
   - Most devices list the maximum number of watts that they use on their label, in their manual, or on the manufacturer's website. If the device only lists how many amps it uses, note that amps in the U.S. can be converted to watts by multiplying by 120. If you can't find a number for a device you use, try checking a website such as: `http://michaelbluejay.com/electricity/howmuch.html`.
   - A few devices are hard to calculate and may even lie on their labels. Do the best that you can for these devices; I'll be lenient regarding your accuracy for these. If applicable, consider:
     - Washing machine: `http://michaelbluejay.com/electricity/laundry.html`
     - Other water usage: `http://michaelbluejay.com/electricity/waterheaters.html`
     - Computers: `http://michaelbluejay.com/electricity/computers.html`
   - Heating is especially hard to calculate. At this time of year, it's probably not an issue. If it is, you can ignore it.
   - Note that the above are the *maximum* watts used. For example, your microwave isn't really drawing 800–1200 watts except when you're actually using it. When a device is only powering a clock, it's probably only drawing 4 or 5 watts.
   - Review Unit 2B in your book if necessary.

   Example: "My microwave draws 900 watts (0.9 kilowatts). I use it for approximately 3 minutes a day and so about 90 minutes in a month (1.5 hours), for a total of $0.9 \times 1.5 = 1.35$ kWh. For the remaining $720 - 1.5 = 718.5$ hours of the month, it draws about 4 watts (0.004 kilowatts) for the clock, for a total of $718.5 \times 0.004 = 2.874$ kWh. So, overall this device uses $1.35 + 2.874 = 4.224$ kWh of energy per month." (Then repeat for your other devices. You don't need to use full sentences if you can find another way to organize your data clearly.)
2. If at all possible, locate a recent electric bill, which will be useful below.
3. Determine how much your monthly energy bill should be. Your cost per kWh can often be found on your electric bill or at the electric company's website. If you can't find it, use the Colorado average of $0.09 per kWh.

Part 2: Conservation and analysis (35 pts)

If you're working in a group, pick one group member's data from Part 1 for use where appropriate. If at all possible, pick a group member for whom a recent electric bill is available. Write a typed paper of about one to three pages in length that addresses the following questions. *Present this in a structured paper that meets the normal expectations for formal writing: don't just write a list of disjoint answers.*

1. Briefly describe the method you used in Part 1. Do you think that the method provided you with an accurate answer? Does the answer agree with your electric bill (or, if a bill isn't available: is your answer reasonable)?

2. Speaking in terms of general categories, what were some of your largest uses of electricity?

3. If working in a group: did the group members all get similar answers? If not, what do you think was primarily responsible for the differences? (This will probably be related to the previous question.)
   If not working in a group: how would you guess that your energy usage compares to those of your peers? Are there reasons why you'd expect your numbers to be higher or lower than average?

4. Environmentalists offer various strategies for conserving energy (for example, using CF lightbulbs instead of traditional lightbulbs, washing laundry in cold water, replacing devices with more energy efficient models, changing the energy settings on computers so that they enter a sleep state more rapidly, unplugging cell phone chargers when not in use, etc.). Pick a few of these or other claims that you've heard and estimate how much you would save by implementing them (or how much you are already saving if you're already doing them). Express these savings as a percentage of your current electric bill (see Unit 3A).

5. Do you think that these conservation strategies are "worthwhile" for you individually? (Note: it's up to you to decide how you measure "worth," so no answer to this question is wrong as long as it's well thought-out.)

6. What would the effect be if everyone in the United States implemented these strategies? (Make any reasonable assumptions necessary in computing this, but be sure to explicitly state what assumptions you make. There are about 309 million people and 112 million households in the U.S., but not everyone will be affected by every conservation strategy. See Unit 3B.) Would this be "worthwhile?"