

6.084 | Problem Set 1 *Due Friday 2006-09-15*

Make the following estimates as much as possible without looking up any numbers: Just keep on dividing and conquering until you get an estimate. But if you have to look up a number, say which one(s) and your source.

1. Estimate the orbital velocity of the earth around the sun, drawing a tree to explain your solution.
2. Suppose a newspaper article asserts that the annual spending on health care in the United States will soon surpass \$1 billion. Does this number seem reasonable, is it far too small, or is it far too large? Draw a tree diagram to explain your choice and your own estimate for this amount.
3. What is the data rate (bits/s) of a 747 filled with DVD's crossing the Atlantic? Draw a tree to explain your solution. Why isn't this transmission method used to replace the transatlantic fiber-optic cables that form part of the Internet?
4. How many barrels of oil do cars use per year in the United States? Draw a tree to explain your solution. **After** arriving at an estimate, look up the individual figures you used as well as the final value, and make a table listing your values and the looked-up values. [Your solution will be evaluated based on your method and on how well you explain it, not on the accuracy of your numbers, so don't worry or feel pressure to make the two columns agree!]
5. Find a value (cost, energy, power, etc.) in a print publication, e.g. in a newspaper or journal (not a website except if it's the online version of a print publication). State the value and source, and check it using divide-and-conquer reasoning. Use a tree to explain your reasoning.
6. Think of (but don't solve!) any approximation problem, perhaps from your research or from something you've noticed and wondered about in the world around you. It need not have anything to do with the topic du jour (divide and conquer). Let your imagination roam. Particularly interesting ones will be solved in class or become raw material for other homework problems!