SHOW YOUR WORK: William Mulholland
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Show your work! Showing your work is so important that I may take away points for *correct* answers if no work is shown and the problem is non-trivial. Few of the problems we'll be doing take only one step. ***Show the steps*** to the answer. You should have *at least* several steps in most answers; when in doubt, slow it down and take more steps. Use **LEGIBLE WRITING** for the steps; many mistakes appears to be caused by students misreading their own writing! Paper is cheap; use lots of it.

There are many reasons to show your work. You will generally get higher test scores if you show your work, because then teachers (including me) can give you partial credit (because we can see what you understood). It will also help us help you – by showing your work, it is easier to determine what went wrong, and thus you can change how you solve problems to avoid the problem again. In the professional world, you *cannot* just show "the answer" without justification on important problems; even experts make mistakes. An important decision will normally get reviewed (requiring something to review!), and you have to back up your claims. "No proof" is the same as "wrong answer".

William Mulholland (September 11, 1855 – July 22, 1935) was a famous man who led development of the Los Angeles water supply, making the city possible. He was considered a great man in L.A. for years. But his career ended when his St. Francis Dam failed on March 12, 1928, just hours after being inspected by Mulholland himself. A 10-story wall of water destroyed everything below, including the town of Santa Paula. The final death count is estimated at 450 or higher, including 42 school children.

The causes were numerous: The ground was not a good place to build a dam, the concrete was poorly made, and "extra stress, not engineered for, was placed on the Dam when, at some point during construction after the foundation was poured, the Dam's height grew from 175 feet with a water capacity of 30,000 acre feet to 185 feet and a 38,000 acre feet capacity. Calculations to validate changes made to the St. Francis Dam when the additional ten feet of height were added do not appear in the records... "

In short, the problem is that Mulholland did *everything* himself, and he kept most of the justifications in his head. He designed it and ran every bit of the project... *without* showing his work to anyone else (to check it). He was a very smart and able man; he had probably read every book relating to the topic, and was one of the world's leading experts. But he made a number of horrific blunders that were only possible because he didn't show his work to others for checking. He deeply regretted what happened; after the disaster Mulholland resigned, saying, "The only people I envy in this thing are the dead." He was widely reviled after this disaster, and lived in seclusion for a few years before his death.

Now, I'm *not* saying that those who don't show their work have Mulholland's hubris. My point is that even very smart and experienced people can make terrible mistakes. Thus, it's important to *write down* why you believe something is true (in math), so that you and others can check it. You'd need to do it in the real world, and you need to do it now so you can get partial credit. So – please do it!!

References:

- "The St. Francis Dam collapse and its impact on the construction of the Hoover Dam " Thomas M. McMullen, Master of Science, 2004 (Thesis). https://drum.umd.edu/dspace/bitstream/1903/1672/1/umi-umd-1629.pdf
- "Grim Society Interview: Dr. J. David Rogers on the St. Francis Dam Disaster" by Dave Hogan and Wendy Larsen-Cleaves. http://www.grimsociety.com/archives/rogers.html
- "William Mulholland". Wikipedia. 2007-10-08. http://en.wikipedia.org/wiki/William_Mulholland