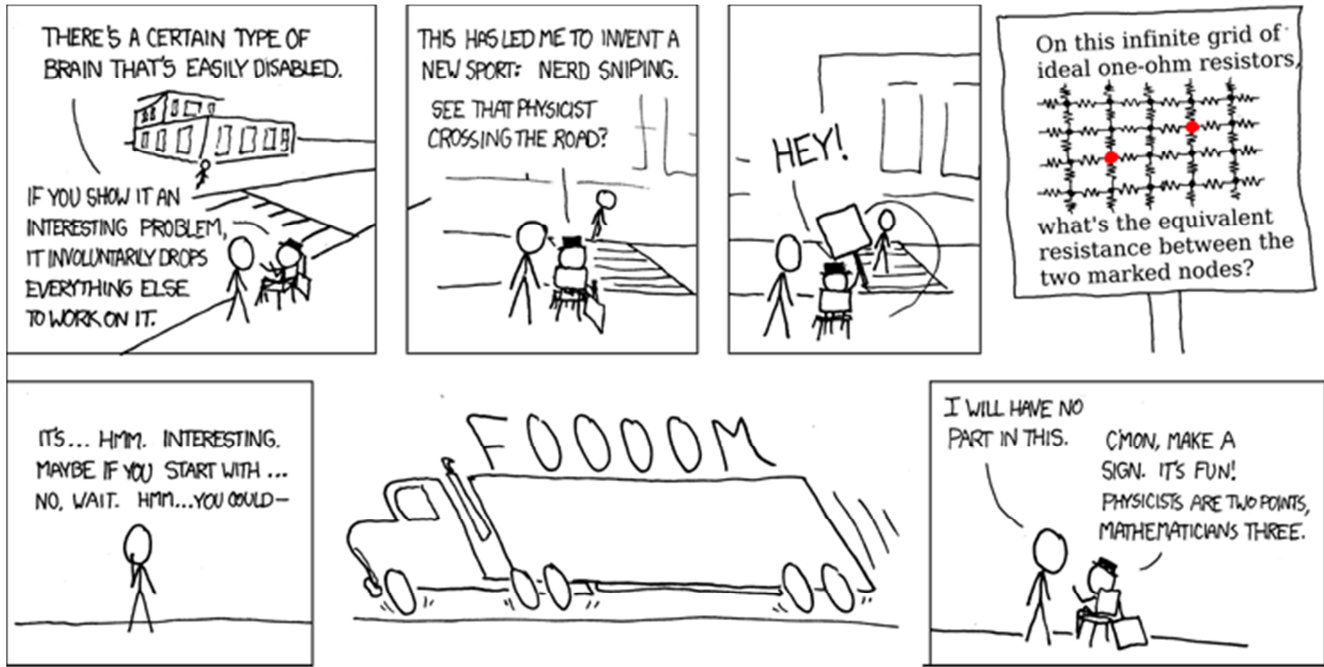# Virginia Tech
1 8 7 2

READ THIS NOW!

- Print your name in the space provided below.

- There are 5 problems, priced as marked. The maximum score is 100.

- The grading of each question will take into account whether you obtained a correct solution and how well you presented your analysis and justified your logic. In most cases, as much weight will be given to the presentation and explanation of your analysis as to whether the solution is fully correct. Legibility will be strongly considered in the grading. You may use scratch paper to work out your solution before finalizing it on the exam.

- Externalize! Whether it's a drawing, a table, an equation or something else, externalize! And make the externalization explicit in your answer! Label things for clarity!

- You may use the supplied extra paper for scratch work. Write your name on any scratch work sheets you use and turn those in with your exam.

- All final answers must be written on the test form itself.

- When you have finished, sign the pledge at the bottom of this page and turn in the test.

- This examination is closed book and closed notes, aside from the permitted one-page formula sheet. No calculators or other computing devices may be used. The use of any such device will be interpreted as an indication that you are finished with the test and your test form will be collected immediately.

- Until solutions are posted, you may not discuss this examination with any student who has not taken it.

- Failure to adhere to any of these restrictions is an Honor Code violation.

Name (Last, First) _____
                                                                                    printed

Pledge: On my honor, I have neither given nor received unauthorized aid on this examination.

_____
                                                                                    signed

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1. [20 points] The Channel Forty-two weather team reported the temperatures in Bleaksburg at noon for each of the last five days, rounded to the nearest degree. The five temperatures were all different, and the product of the temperatures was, curiously, equal to 12. Can you determine what those five temperatures must have been (although not their order), or is there not enough information, or are the given facts impossible?

2. [20 points] In a foreign language *ho lew trj* means "buy that dog", *lew ra* means "dog food" and *gi trj nk* means "that green car". Which words would be used to say "buy food"? Why?

3. [20 points] Two ranchers sold a herd of cattle and received as many dollars for each animal as there were cattle in the herd. (If there were two animals, they received two dollars for each one; if three, three dollars for each one; etc. We're told that they started with no more than 15 cattle.) With the money, they bought as many sheep as they could at 10 dollars per head, and a goat with the remainder (less than 10 dollars). Finally, they divided the animals between them. There was, however, an odd number of sheep. So one rancher, who got the goat, was given his friend's new pocketknife as compensation. If this was an equal division, what was the value of the pocketknife? Is it possible to say anything precise about how many cattle the two ranchers sold? If yes, what?

4. [20 points] Four lawn care fanatics, Fred, John, Alice and Nina between them own 17 grass cutting devices consisting of shears, string trimmers, and power mowers. Fred likes to be accurate, so he owns 4 shears but no string trimmers. John is just the opposite; he prefers speed and has a small lawn, and therefore his implements include 2 shears and 3 mowers. Alice's equipment includes 2 string trimmers and 1 power mower. Nina, a woman of simple tastes, has a total of 3 implements, among which is 1 shears, but 0 string trimmers. Altogether, the four own 7 shears and 7 mowers, and a total of 17 implements.

Note: a good, well-labeled externalization for this problem will be sufficient to explain your logic.

5. [20 points] Four men were asked about their yearly incomes. Their names were Earl, Moe, Luis, and Randy and their professions are architect, carpenter, plumber, and mason (not necessarily in that order). Each made two statements, but the only statements whose correctness can be depended on are those in which the speaker specifically mentions his own profession. Other statements may or may not be true.

Earl: The plumber makes three times as much as the carpenter. The architect makes more money than I do.

Moe: The carpenter makes more money than the plumber. Luis is either the mason or the architect.

Luis: I make more than the architect. The carpenter makes less than each of the others.

Randy: The plumber makes twice as much as the carpenter. I make more than the mason.

Match each person with his profession.

Note: For this problem, explain all your inferences carefully. Every conclusion you reach must be justified by referring to the statements given above, or other facts you've inferred from them. Be precise and complete. Use externalization.