

For this assignment, you may (and are encouraged to) work in pairs; if you do so, only one member of the pair should submit a solution to the Curator and you must make sure that both students are identified (name and PID) in the submitted solution. You must also write your solutions in such a way that it is clear how each member contributed to deriving the solution.

Prepare your answers to the following questions in Word document or a plain ASCII text file; submissions in other formats will not be graded. Submit your file to the Curator system by the posted deadline for this assignment. No late submissions will be accepted. No other formats will be graded.

You will submit your answers to the Curator System ([www.cs.vt.edu/curator](http://www.cs.vt.edu/curator)) under the heading OOC02.

**For each question below, the quality of your explanation of how you derived the answer will carry as least as much weight as whether you've stated a correct solution. For each problem, apply one of the heuristics discussed in the course notes, and explain how you applied it.**

- [25 points] Solve the following cryptarithm. Explain exactly how you deduced the solution.

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      FORTY
        TEN
        TEN
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      SIXTY
  
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Remember that each letter stands for a different digit (base-10), and that there are no leading zeros.

- [25 points] Solve the following classic puzzle from Sam Loyd (1841-1911). Explain your logic clearly.

This odd little problem in domestic arithmetic was sprung by the cook upon Mrs Smith, when she wanted to know what the grocer charged for such small eggs. "I paid twelve cents for the lot," replied Bridget, "but I made him throw in two extra eggs because they were so little, and you see that made them cost just one cent a dozen less than his first asking price!"

How simple and natural the whole transaction sounds, just as it might occur at home, and yet how many of our clever young puzzlists can solve Bridget's problem by telling just how many eggs she received for her twelve cents?

- [25 points] A reader has placed her copy of Tolkien's *The Lord of the Rings* on a shelf in her library. It turns out her copy consists of seven volumes, corresponding to Tolkien's original organization of the books. The seven volumes are:

<i>Book 1: The Ring Sets Out</i>	283 pages
<i>Book 2: The Journey of the Nine Companions</i>	253 pages
<i>Book 3: The Treason of Isengard</i>	252 pages
<i>Book 4: The Journey of the Ring-bearers</i>	189 pages
<i>Book 5: The War of the Ring</i>	197 pages
<i>Book 5: The End of the Third Age</i>	182 pages
<i>Appendices</i>	189 pages

The books are placed on the shelf in the correct order (as listed above), and right side up. Unfortunately for the reader, her library has been invaded by a rather hungry bookworm. The worm finds page 1 of the first volume (which page it does not damage), and eats its way page by page until it reaches page 1 of the final volume (which page it also does not damage).

How many pages does the bookworm damage?

4. [25 points] During the pilot episode of the new hit TV show *CSI: Dubuque*, the forensic team finds a well-ripened corpse inside a utility shed that measures 24 feet by 18 feet by 9 feet. Aside from the corpse, the utility shed is occupied by a large number of greenbottle flies.

One of the CSI team members makes the statement "I bet that if I had a shoebox I could slap a lid on it and catch ten flies in here!". The senior CSI team member replies "Well, if your shoebox was 4 inches by 6 inches by 12 inches, how many flies would have to be in here for your statement to be at all reasonable?"

How should the team member respond, and how could she justify her response?