

M316K HANDOUT: PROJECT 1, INVESTIGATING ALGORITHMS

Due: October 17, 2008

In this investigation you will choose one non-standard algorithm for subtraction and one non-standard algorithm for **either** division or multiplication to investigate. The algorithms may be chosen from those presented in the text (chapter 3) or explorations manual (explorations 3.6, 3.13, and 3.19) or may result from outside research (the internet or other textbooks, for example). If you choose to use a non-standard algorithm from outside research, make sure to cite your resources.

For each of the two algorithms you should:

- Write a set of directions so that someone who has never seen this algorithm could use the algorithm.
- Give at least two examples of problems done using the algorithm. You should think about providing examples that address difficulties students might have in mastering the algorithm.
- Provide a general overview of the strengths and weaknesses of the algorithm. Sample questions you might consider:
 - In what situations might this be a good (or efficient) option?
 - In what situations might students be prone to errors?
 - What model of the operation does the algorithm utilize?
- Explain how the algorithm arrives at the correct answer. This should be done for the general case and not for a particular example. In other words, you should explain why this algorithm **always** results in a correct answer. Some things to think about in this section:
 - Showing how a non-standard algorithm is like the standard algorithm is **not** the same as explaining mathematically why the algorithm produces the correct answer.
 - In many cases, a diagram or picture might help to explain the connection between the concept and the algorithm.

SCORING RUBRIC:

1. Example problems: 3 points per example for each of four examples (two per algorithm) done correctly (12 points maximum)
2. Set of directions: (0 – 2 points per operation)
 - 2 points: directions can be followed by a mathematically knowledgeable reader; algorithm performs correctly
 - 1 point: directions are incomplete; the algorithm can not be completed without inference by the reader
 - 0 points: directions do not exist
3. General Overview: (0 – 2 points per operation)

- 2 points: discussion is complete; student has thought about all relevant aspects of the algorithm
 - 1 point: discussion is incomplete
 - 0 points: discussion does not exist
4. Explanation of how the algorithm arrives at the correct computation (0 – 2 points per operation):
- 2 points: justification meets mathematical standards of proof in the general case
 - 1 point: justification explains why procedure works by showing the mathematical link to the standard algorithm; justification is limited to proof by example
 - 0 points: Proof does not meet mathematical standards
5. Content: (0 – 6 points possible)
- 6 points: work reads as an organized paper with an introduction, a discussion of the work and a conclusion; grammar, spelling and word usage correct
 - 3 points: work lacks coherence; while an introduction may have been attempted, the paper as a whole reads like an unrelated sequence of notations; grammar, spelling and word usage correct
 - 1 point: work is a list of answers to the questions posed in the investigation with no introduction or attempt to link the parts of the problem; grammar, spelling and word usage correct
 - Deduction of 1 point or part of a point for grammatical, spelling or word usage error