

M316K – Foundations of Arithmetic  
Spring 2009  
Problem Set 7 – Due Friday, March 13

*“If I am given a formula, and I am ignorant of its meaning, it cannot teach me anything, but if I already know it what does the formula teach me?” – St. Augustine*



This week’s problem set is on multiplication. You’ll probably find these problems to be trickier than the addition and subtraction problems, so start early and make sure you have time to ask questions if you need to!

**Section 3.3:** 2\*, 6, 7\*, 10, 15\*, 19, 21, 35, 40, 41, 47, 52.

In Problem 2, write your problems so that each problem uses a different model of multiplication (see the discussion at the beginning of the section).

You can find the trick described in Problem 6 in the film *Stand and Deliver*, which happens to be one of your friendly instructor’s favorite movies.

In Problem 7, you’re only responsible for parts (b) and (c) (but see the Bonus Problems section).

In Problem 15, explain where you found the answer to each question.

On problems like 41 and 47, be sure to explain your reasoning! This is the most important part of these problems.

**Bonus Problems**

- B1.** Explain *why* the “Russian peasant algorithm” introduced in Problem 7 works. The more careful and thorough your explanation is, the bigger the bonus.
- B2.** Suppose your friendly (but devious) instructor shows up in class one day and instructs you as follows: “I want each of you to put away your things and get out a sheet of paper. On that sheet of paper, I want you to write your name, and either an ‘A’ or a ‘B’. If everyone in the class chooses ‘A’, then everybody in this class will receive a grade of A for the semester. However, if anyone in the class chooses ‘B’ – even if it’s just one person – then everybody who chose ‘B’ will receive a grade of B for the semester, and everybody who chose ‘A’ will receive an F for the semester. You are not allowed to communicate or to look at anybody else’s paper. You have one minute to make your decision.” Assume that you are unable to communicate in any way with anyone else; you aren’t even allowed to make eye contact with your classmates to try to figure out how they are thinking. What is your thought process during the one minute in which you have to make a decision? Which letter do you write down? Would your decision be different if there were more/fewer people in the class? What if it were just the people in your study group rather than the entire class? (*Note:* This situation is called the *Prisoner’s Dilemma* and is a very famous problem that bridges several disciplines: mathematics, philosophy, psychology, even economics and political science! If you want more information on the subject, the Wiki page actually gives a pretty good amount of backstory on the problem.)