

M316K – Foundations of Arithmetic  
Spring 2009  
Exam 2 – Version P

You have **50 minutes** to take this exam. No books, notes, calculators, or other electronic devices are allowed. Please write everything you want me to grade in your blue book; you will be allowed to take these questions with you when you are done. On the front of your blue book, please indicate which five questions you want graded. If you don't choose which questions I should grade, then I will choose for you at random. Also, please sign the upper right corner of your blue book; by your signature, you affirm the following Honor Pledge:

*"I pledge that I will neither give nor receive any unauthorized help on this exam. I will not use any books, notes, calculators, or other electronic devices while taking this exam. I will not attempt to look at any other student's paper, nor will I engage in behavior that will put me at risk of accidentally seeing another student's paper. I will stop working immediately when time is called."*



**PART A: Reading.** Please answer **one** of the following questions. Keep in mind that your goal is to demonstrate that you have read the material and understood the important points, so don't spend time trying to craft an exquisitely written essay. There is no length limit for this question, but you should easily be able to fit your response on one page.

- A1.** On page 178 of the text, Bassarear says that "although multiplication can be seen as repeated addition, if that is *all* you see multiplication as, then your students can achieve only limited understanding." Give two different, brief arguments supporting this statement. (You can use examples, problems, classroom situations – whatever you deem appropriate.)
- A2.** Suppose your friendly (but demanding) instructor asks you to find all of the prime numbers less than 200. Assuming you had plenty of time (and paper), how would you perform this task without checking two hundred numbers one-by-one to determine whether each one is prime? Describe a reliable, step-by-step method you can use to find all of the prime numbers less than 200. Try to include enough detail to convince me that you could carry out this method if you had time to do it (one way to do this is to show the first few steps of the process).

**PART B: Explorations.** Please answer **two** of the following questions. Do not mix-and-match parts of different questions; if you choose to answer a question, you are expected to answer all parts of that question.

- B1.** Consider the subtraction problem  $357 - 169$ . Show how to perform this operation using the standard algorithm, and then model the operation using base-ten blocks. (Don't worry about drawing the blocks in full detail; just make sure your picture shows what you're thinking.) Show how the steps in the standard algorithm correspond to things that we see or do when we use the manipulatives. (For full credit, show at least two correspondences.)
- B2.** For each of the following calculations, explain why the answer given is not reasonable.
- (a)  $583 + 742 = 1225$
  - (b)  $4281 - 3785 = 504$
  - (c)  $84 \times 67 = 5028$
  - (d)  $4368 \div 62 = 704$

**B3.** Answer the following questions:

- (a) Find the prime factorizations of 42 and 98.
- (b) How many divisors does each of these numbers have? Show your work.
- (c) Two security guards, Monica and Nathaniel, pass a certain location on campus regularly while they make their rounds at night. At exactly midnight, the two guards meet at this location. Monica checks this location every 42 minutes, whereas Nathaniel checks the location every 98 minutes. After midnight, what is the next time (in hours and minutes) Monica and Nathaniel will meet at this location?

**PART C: Problem Sets.** Please answer **two** of the following questions. Do not mix-and-match parts of different questions; if you choose to answer a question, you are expected to answer all parts of that question.

- C1.** Suppose that  $A$  and  $B$  are digits such that the product of the two-digit numbers  $A6$  and  $6B$  is 4788. Find the values of  $A$  and  $B$ . You may use any non-guessing method you wish, but please explain what you are doing. (Here  $6B$  is the two-digit number with tens digit 6 and ones digit  $B$ , not “6 times  $B$ .”)
- C2.** Cody wants to save up enough money to take his entire class out to the Cheesecake Factory for dinner during Finals Week.<sup>1</sup> Cody has 64 students in 2 classes, and he expects the average student to spend \$20 on food. Cody starts saving on April 8; he plans to take his students to dinner on May 15. Despite being a graduate student and having taken an oath of poverty (usually called a “loan agreement”), Cody manages to put away \$300 every week.
- (a) When the big day rolls around, will Cody have enough money to take his students to dinner? You can either perform an exact calculation or use estimation, but if you estimate, your method should reliably determine the correct answer.
  - (b) Suppose that at the end of the meal, Cody leaves a \$100 bill as a tip for the waiter. Will the waiter find this tip generous, average, or insulting? Again, you can either perform an exact calculation or use estimation.
- C3.** For each of the following statements, determine whether the statement is true or false. If the statement is true, explain why it is true. If the statement is false, give an example showing that the statement is false.
- (a) If  $a$  and  $b$  are odd numbers, then  $a - b$  is an even number.
  - (b) If  $a|n$  and  $b|n$ , then  $ab|n$ .
  - (c) If  $a$  is even and  $b$  is odd, then the GCF of  $a$  and  $b$  is odd.

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<sup>1</sup>Like the hundreds of problems you’ve come up with that involve me buying you food, this problem is completely fictional. Completely.