

M316K – Foundations of Arithmetic

Spring 2009

Problem Set 12 – Due Friday, April 24

“In symbols one observes an advantage in discovery which is greatest when they express the exact nature of a thing briefly and, as it were, picture it; then indeed the labor of thought is wonderfully diminished.” – Gottfried Wilhelm Leibniz (LEEB-neeZ)



Note that the due date is Friday once again. We should be on schedule for the rest of the semester.

Section 5.2: 10*, 12*, 17, (35).

On Problem 10, the “equation” you are being asked to justify is really a rule: if two fractions $\frac{a}{b}$ and $\frac{c}{d}$ are equal, then $ad = bc$. Explain why this is the case. You should avoid using examples in your explanation; your explanation should be something that works in every case (no matter what the numbers are). Feel free to assume that all the numbers are positive.

On Problem 12, you only have to write up your answers to (c), but I do want you to try doing the others (by hand, without a calculator) on your own. On (c), explaining your reasoning is very important.

You don’t have to turn in Problem 35, but make sure you can do problems like these.

Section 5.3: (1), 4*, 7, 9*, 15*, 27, 29, 44.

You don’t have to turn in Problem 1, but make sure you can do problems like these accurately and efficiently. (In particular, you should be able to do addition and subtraction of mixed numbers, and sometimes multiplication of a whole number times a mixed number, without changing mixed numbers to improper fractions.)

On Problem 4, your explanation should convince me which product is greater without actually doing the multiplication. If you do the multiplication as part of your explanation, I’ll ignore that part.

On Problems 7 and 44, you don’t have to do the parts whose answers are given in the back of the book.

On Problems 9 and 15, follow Bassarear’s instructions: first find an estimate (and explain your estimate), then find the exact answer. On Problem 15, you’ll have to make an assumption about how close to the “E” the fuel gauge is. (If you’re like me, you have experience with this sort of thing.)

Bonus Problems

B1. Suppose that a , b , c , and d are different digits (whole numbers from 0 to 9) such that $\frac{a}{b} + \frac{c}{d} < 1$. How close to 1 can $\frac{a}{b} + \frac{c}{d}$ be? (This is a problem from a math contest for children age 13 and under called the Primary Math World Competition.) Using four different digits for a , b , c , and d , try to make this expression as large as you can without reaching 1. The closer you get, the bigger the bonus.

B2. Choose a positive integer. The person who chooses the smallest positive integer that nobody else chooses will receive four bonus points. (So for example, if ten people answer the question and their answers are 1, 1, 1, 2, 3, 3, 5, 7, 10, and 42, then the person who chose 2 will get the bonus points, since 2 was the smallest positive integer that nobody else chose.)

B3. Explain the strategy you used when choosing your answer to bonus question B2.