

Math 2001 - Group Homework 5

1. Choose a new leader, scribe and presenter for this week. Each job must be filled by a different person than last time.
2. Your group's work product will be the filled-in Report on Group Work, along with the solutions to the problems in Main Task 2 below. These can both be handwritten, but must be written neatly. Turn both of these in on Wednesday.
3. As before, for the rest of the meeting, the leader should record on the Report of Group Work any questions for the instructor (anything your group was not able to resolve together), along with a basic narrative description of events of the meeting. Help the leader by suggesting how to briefly summarize what transpired, and wait for the leader to finish. As before, the scribe is responsible for writing up the solutions to the assigned problems. The scribe must also share copies of the returned homework with the rest of the group.
4. **Main Task 1:** Review the daily homework, Your Best Work homework, reading, quizzes, midterm, returned group homework and in-class work covered since the last meeting. Everyone should take out old homeworks and last week's group homework, and go over solutions to each problem. Take turns, each person sharing their answers with the group. Ask questions of each other until everyone understands everyone else's answers and all questions and concerns have been resolved. If something is unresolved, put it on the list of questions for me.
5. **Main Task 2: Group Homework** Do the following problems. You must do these problems together, and do not show up having done them already. Do not divide up the work. Instead, on each problem spend several minutes each thinking silently, then construct the solutions collaboratively on one sheet of paper, discussing as you go. All group members (not just the scribe) should be participating in the writing during this process. Do multiple drafts if necessary. Do not move on to the next problem until everyone in the group is satisfied with the result. If you find yourself getting ahead of your group, then help guide your groupmates through the solution. If you find yourself getting behind, tell your groupmates you feel lost and ask questions. Sharing your confusion and asking questions counts as as equal (or greater) contribution as answering questions.
 - (a) Is the set of rational numbers closed under addition? If not, give a counter-example. If so, then prove it.
 - (b) Is the set of irrational numbers closed under multiplication? If not, give a counter-example. If so, then prove it.
 - (c) Is the set of integers divisible by p closed under subtraction? If not, give a counter-example. If so, then prove it.
 - (d) The goal of this question is to investigate divisibility rules.
 - i. In grade school or junior high, most of you learned a trick for determining whether a number is divisible by 3, involving the sum of the digits. State the rule carefully (either as an if-then or as a biconditional, depending on what you think is true). Prove it for 4-digit numbers.
 - ii. There is another number besides 3 that an analogous rule works for. Determine what number that is, and prove the rule works for 4-digit numbers.
 - iii. Suppose a four-digit number has digits $abcd$. There is a rule relating whether a number is divisible by 11 and whether $a-b+c-d$ is divisible by 11. Carefully state the rule and prove it.
6. Before the meeting ends, help the scribe make sure that the Report on Group Work has been filled in and everyone has signed it. The scribe will take home the final solutions you have written together as a group, and typeset them (with latex), or type them, or write them up neatly and turn them in. I recommend that the scribe send the final copy to the groupmates to proofread before submitting them.