Most of your learning in Math 106 is based on solving problems in groups, and we are well aware that many of you will feel insecure about this. Most of you will be afraid you won’t be able to contribute anything to the group discussion, or that you’ll spoil the good work of all those other clever people (you’ll eventually realise that most Math 106 students have the same fears); some of you might be afraid of showing your ignorance in front of your group, or (much less commonly) might be unhappy that other students will benefit from your good ideas. All of these concerns are natural, but the evidence that this is the most effective way to learn mathematics is so clear that there is no doubt that this is the way Math 106 must operate.

Responsibilities Of Group Members

1. If you don't understand something another group member says, you must ask for an explanation.
2. If another group member does not understand something you have said, you must try to explain it.
3. If you believe that your group has made an error or omission, you must point it out and explain why you believe it is an error or omission.
4. If another group member points out what they believe to be an error or omission, you must listen to their criticism and consider it carefully.
5. If you believe that something you are doing is correct, you must explain why you believe it is correct.
6. You must treat all group members with respect. Criticism must be done courteously, and must not be or appear to be personal. Remember that you’re all trying to achieve the same result.

General Advice

* Speak to me or your tutor if you need help in joining a problem group. Note that the University recommends that you should spend four hours per credit point per week working on each unit. This means that in addition to your lectures and tutorials you should spend about eight hours per week on Math 106. Consequently, your problem partner(s) don’t need to be in the same tutorial group as you, although it is often a little more convenient if they are.

* Always make sure your group has arranged a fixed time to meet again before you finish a session.

* Do not try to work independently and then put the ideas together. That’s a guaranteed way to waste a lot of time (and still not solve the problem); almost all of your set of problems are too difficult for you to solve on your own. Work together until each of you goes away with an agreed task to complete before your next meeting (e.g., do these calculations, make this model, do some more work on this particular method, look up so-and-so in the library, ...).

* Dysfunctional groups: If you are unhappy working within your group, move to another one. If as a group you feel that one member is not making a serious attempt to participate, it is your responsibility to do something about it. If you can’t convince that member to work with you, then in your report you should omit that member’s name completely, or at least indicate that student’s failure to participate. Remember your tutor can help you arrange a change of group.

* It’s very important to realise that your “weakest” student is your group’s greatest asset. Until you can explain what you are doing clearly enough for your so-called weakest student to understand, you don’t understand it clearly enough yourself. Don’t waste the opportunity to benefit from the presence of someone who is struggling to understand.

* Remember too that regardless of how much or how little s/he knows, everyone can make valuable contributions to the group’s effort, e.g. by generating ideas for solutions, recording the discussion, demanding clear explanation of points you don’t understand, carrying out calculations, keeping the group functioning by encouraging the others to press on when a promising line of attack seems to be failing ... You won’t make all of these contributions all of the time, but you should keep the possibilities in mind.

* Everyone in a group should have complete contact details for everyone else. Avoid the situation where if one group member becomes unavailable the rest of the group is unable to complete/submit the work.
MATH106 - Second Half Year 2003

Mathematical Problem Solving in Groups

It’s up to your group to decide how you choose to operate. Many of you have no experience of working on mathematics in groups, so here is one suggestion on how you might choose to attack a problem. Remember that you are entitled to operate entirely differently if you wish.

1. Choose two or three problems that look vaguely interesting. Don’t try to base your choice on whether a problem looks easy or hard, or whether you think you can see how to do it, or whether you’ve seen one like it before. I’ll be very disappointed if any of our problems can be classified that easily (and if I discover that there are any, I’ll immediately remove them from my list of suitable problems).

Now tentatively agree among your group which problem you’ll attack first. This isn’t a life or death decision. If it turns out that you’ve made a bad choice, you’ll have ample time to change your mind and start a different problem.

2. Brainstorm. Give every member of the group the opportunity to put forward any idea that s/he thinks might be remotely relevant to your chosen problem. The object here is to generate a list of as many possible starting points as you can imagine (even if you have no idea where you think that starting point might lead you). You won’t get anywhere if you just stare helplessly at the problem and say “I can’t do it”, and there’s no point in giving up before you see where an idea might lead you, so suggest something. At this stage there is no such thing as a silly idea, or an idea that can’t work, so no idea should be discarded yet. (The best solution to one of your problems was discovered by a tutorial group five years ago. It’s a problem that was used before, and the tutor was so familiar with it that he thought he knew all about it. So when they told him what they had in mind (using material from lectures two weeks earlier) and asked whether it would work, he immediately said “No!”—then he thought again, and suggested they try it. Their method not only worked, it turned out to be much nicer than any of the other four methods of solution that he already knew. Two years later he saw their solution again—it had been written by a professional mathematician and published in an overseas Mathematical Journal.)

3. Arrange your list of possible approaches in what you think is the most promising order. Don’t agonise over the list; your order will probably be wrong, but that doesn’t matter, because you can come back and rearrange it whenever you wish.

4. If your initial discussion produces more than one idea that you think may be viable, it’s sometimes useful to share out the possibilities so each of you can pursue individually a different line of attack. Obviously in this case the first person to get a bright idea should have the right to follow it up.

If you’re very short of ideas, go away and explore further individually. After your initial discussions, you’ll often find that you can come up with a few more possibilities when you spend some time thinking quietly on your own. If none of you can think of anything else, it might mean that you’ll need to choose a different problem, but don’t give up on this one yet.

5. Next time you meet, focus on one approach that looks the most promising. Make sure you give it a fair try, but if despite your best efforts you don’t get anywhere, go back to your list of possible approaches, review the order, and try another possibility.

6. Once you think you’ve solved the problem, go back and try all your other possible methods again. You might be able to confirm that your original solution was correct, you might be able to improve on your original solution, or you might even find a nicer way to solve the problem.

7. Once you are satisfied that all of you understand your solution (“all” is absolutely essential), assign one person to prepare your first draft for presentation. Then meet again and make sure you are all happy with what s/he has written. You have not finished the problem until you are all convinced that you have: stated your solution clearly, explained why that solution must be correct, described your method of solution clearly enough for another Math 106 group to be able to reconstruct what you did, and explained your solution to each other so well that if called upon (you might be!), any one of you could explain it to me or to the class.