

TEACHING STATEMENT — JACK SHOTTON

I enjoy teaching greatly and find it rewarding both personally and mathematically. I have substantial experience at a variety of levels:

- In 2011-2012 I supervised for the first year introductory pure mathematics course and a third year course on number fields at Cambridge University — this involved marking and discussing the homework problems with pairs of undergraduates and explaining various points from the courses.
- Since 2011 I have taught at Imperial College London, including: grading tests and coursework, assisting in homework discussion sessions and teaching supplementary classes for the joint maths and computing students.
- In 2014 at Imperial I prepared and delivered an introductory class for the entire incoming first year (over 200 students).
- Since 2011 I have privately tutored at high school and university level.
- Since 2007 I have volunteered with the maths olympiad activities in the UK, including: giving many problems sessions and talks at maths camps, mentoring talented high school students by correspondence, setting and marking national olympiad exams, and leading teams to international competitions.

Excellent teaching requires thorough subject knowledge and clarity of thought. This gives the teacher much greater flexibility in how to present the subject in response to the students' particular background and difficulties. Moreover, if I am confused about something, how can I expect my students to understand it? By careful thought and preparation I try to bring this quality to all of my teaching.

Excellent teaching also requires a willingness to listen to the student and to identify, and meet, their needs. Sometimes a student will be shuffling symbols and definitions without a clear understanding of what they mean — in this case, a memorable and intuitive explanation is necessary. Other times, a student can explain what the intuition is but will be finding it difficult to turn that intuition into precise mathematics — the best course then can be to go through a clear and rigorous model solution with the student. It is important for me to help students find for themselves solutions to their questions. Indeed some of the most satisfying teaching I have done has been where I have been able to work with a student to take an idea of their own and produce a solution completely different to the one I had in mind.

When teaching larger groups, it is just as important to maintain interaction between class and teacher. Without doing this, it is extremely easy for people to become lost without the teacher realising it. I also aim to encourage interaction between students — when one student explains an idea to another it is highly beneficial for both. An example of this that I found worked was in a large introductory lecture for the Imperial first year mathematics undergraduates, the aim of which was to introduce them to the idea of rigorous proof. Many of them had previously seen a proof of the irrationality of $\sqrt{2}$ before, and I asked them to work in pairs with one of each pair explaining the proof to a critical neighbour. Most students

discovered subtle assumptions in their proofs which they had not previously been aware of.

In all my teaching, then, I try to adhere to these basic principles: to give clear and appropriate explanations; to come up with simple and illustrative examples; to listen and respond to the students' ideas; to identify and address the students' difficulties; to set exercises that test and extend students' understanding; and to encourage discussion between student and student and between student and teacher.