Duncan Laurie Rokos Report

This summer I spent a total of five weeks working on a maths research project surrounding \( \lambda \)-rings, an algebraic structure with links to multiple areas of pure maths including Representation Theory, Topology and Algebraic Geometry. I worked under the supervision of Professor Damian Rössler, one of the Pembroke pure maths tutors, having asked him about doing a summer project during the Easter holidays. We met in Trinity term to decide the area of exploration, and then again a few times once I was underway with the project (in addition to emailing back and forth!).

\( \lambda \)-rings are relatively unexplored and the content is a bit scattered, so a key aim for the project was to compile a complete theory of the subject, and then take it from the complex world of graduate texts and online resources into a document that I hoped would be accessible to a third-year maths student taking some algebra courses. Further, I was keen to put my own spin on the topic, and perhaps include some fairly original maths.

I started on my project by heading to Oxford for a week in late July – I was keen to get a rough idea of \( \lambda \)-rings early on and then leave the subject alone for a while, since it often takes a while for new maths concepts to sink in. The funding is very flexible and allowed me to do this easily. Reading through texts and internet pages was incredibly slow going, which emphasised how important it was for my document to be easy reading (or at least as much as maths can be!). However, I managed to make some good progress.

Returning to the project in early September, I was able to crack on with the basic theory, and started picking which elements I would include and in which order. I wanted to fashion a narrative of sorts as you read through my paper, which would help to correct the accessibility problems of other texts. As I became more comfortable with the content, I began to include some original elements – nothing too complicated, just posing and answering questions that I had thought of during the research stage. I finished off the content of the project with an exploration of a \( \lambda \)-ring example that arises in one of the third-year algebra courses.
(Representation Theory). Finally, in writing up and actually creating a maths paper, I learned how to type in LaTeX, a maths typesetting language which is used for dissertations and papers (so this will come in useful this coming year). I’ve definitely developed a greater appreciation of the notes our lecturers create! Damian was a great help with sorting out some troublesome definitions/proofs as I was completing the write-up.

In the end, I feel I was able to correct many of the issues I had found with graduate texts, and it was great to be able to present these ideas in my own way. I managed to include some original elements too, which arose from being able to research some maths outside of an exam-driven context.

The Rokos funding was a fantastic help with this project – it allowed me to get stuck in and have fun with it! The application was really easy and flexible, and I would very much recommend the process for anyone doing a summer project! Whether you’re looking for something to do for part of the summer or considering doing research in the future, Rokos funding is so worthwhile as a way to enable you to have fun exploring something outside of your course!