# Job Description – EPSRC DTP Internship: Frieze patterns and Farey complexes

*“EPSRC’s Vacation Internships scheme gives undergraduate students a taster of what it is like to do research. The students are given practical, first-hand experience of working on and carrying out research in a UK university.”*

Source: [Internships and placements – UKRI](https://www.ukri.org/councils/epsrc/career-and-skills-development/studentships/flexibility-for-funders/internships-and-placements/)

To be eligible for an EPSRC Vacation Internship you **must**:

* be an undergraduate or Masters student in a STEM subject area.
* not have completed your degree studies before the planned end of the internship. An internship should generally take place in the summer vacation **before** your final year of study.
* have a right to work in the UK and carry out the placement whilst resident in the UK. We are **not** able to sponsor visas for the internship.

**About the Role**

In this project you will explore how combinatorics, geometry, and number theory come together in the study of *frieze patterns*. These patterns were first introduced in the 1970s by Donald Coxeter, and they have attracted significant interest recently, in part because of connections with the subject of cluster algebras.

You will learn how the theory of frieze patterns can be understood using combinatorial objects known as Farey complexes. These complexes are fascinating objects, some of which carry a geometric structure associated to hyperbolic geometry. This theory has been developed by the supervisors in two papers [arXiv:1904.11900](https://arxiv.org/abs/1904.11900) and [arXiv:2312.12953](https://arxiv.org/abs/2312.12953). You will also learn about the relationship with continued fractions.

You will join a team funded by the EPSRC research grant EP/W002817/1 and the EPSRC doctoral training grant EP/W524098/1. Your research project will be to understand the connections between frieze patterns and the geometry of the associated complexes, focusing on distinguished complexes of rich geometry. We will work towards a research publication on this topic.

To complement this work, you will create visualisations and animations for inclusion in websites, posters, research presentations, and papers.

The role will develop skills and experience in:

* Combinatorics, geometry, and number theory
* Delivering presentations
* Mathematical exposition
* Mathematical illustration
* Programming

**About the Unit**

The intern will work in the [*School of Mathematics and Statistics*](https://www5.open.ac.uk/stem/mathematics-and-statistics/home/welcome-school-mathematics-and-statistics?nocache=65ef20036b806).

The School provides a supportive and flexible working environment, where diversity is celebrated. The School is active in challenging injustice and promoting equitable treatment for those from marginalised or underrepresented groups. It holds an Athena Swan Silver award for its work in gender equality.

The School is part of the [*Faculty of Science, Technology, Engineering, and Mathematics*](https://stem.open.ac.uk/).

**Key Responsibilities**

* Learn about frieze patterns, Farey complexes, and continued fractions
* Tackle an introductory research problem in this field
* Create visualisations and animations to complement the research

**Skills and experience**

Essential:

* Linear algebra
* Number theory
* Access to a computer and the internet

Desirable:

* Abstract algebra
* Interest in mathematical artwork
* Experience of or enthusiasm for basic programming

If you would like further details about the role before making an application, then please email stem-research-student-support@open.ac.uk quoting the reference number and job title. For academic enquiries about the project, contact the principal supervisor Ian Short ian.short@open.ac.uk.