Rebecca Sheppard

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An aspiring mathematician with research interests in the geometry of numbers, combinatorics and discrete geometry, intending to progress into academic research.

Education

University of Manchester (2025-)

PhD Pure Mathematics

The title of my PhD is integer geometry. At the start of my PhD I continued the research I did in my MMath project into integer circles, before moving on to studying a differential geometry for integers which is invariant under lattice-preserving affine transformations.

University of Liverpool (2021-2025)

MMath (Hons) Mathematics

First Class Honours

In my studies, I covered a variety of topics in pure and applied mathematics. I followed the pure mathematics pathway, developing an understanding of topics in geometry, number theory, algebra and group theory. I took two project modules (to a total of 45 credits) on topics in the geometry of numbers. In the projects, I developed the theory and undertook numerical experiments using Maple and Python. I composed research reports and presented my findings using LaTeX/METAPOST to produce the reports and slides.

Cronton Sixth Form College (2019-2021)

A Levels

A* Mathematics; A* Further Mathematics; A* Physics; A* Chemistry.

Wade Deacon High School (2014-2019)

9 GCSEs grades 7-9 including Mathematics and English; Cambridge National Certificate grade D2.

Research Experience

MATH490: Project for MMath (2024 – 2025)

University of Liverpool

This project expanded on the study of integer circles as introduced in my MATH499 project. I investigated the density of the intersections of integer circles and introduced

the notion of inscribed integer circles of a polygon, which led to a study in the area of splitting integer angles.

LMS Undergraduate Research Bursary (2024)
University of Liverpool

In summer 2024, I undertook a summer research project in an area of integer geometry that was supported by the London Mathematical Society Undergraduate Research Bursary and the University of Liverpool. This project focused on finding the spectra of radii of circumscribed circles in integer geometry and led to a research paper.

MATH499: Project for MMath (2023 – 2024)
University of Liverpool

In this project I introduced the notion of a circle in integer geometry and computed the density of integer circles with respect to an exhaustive sequence of subsets. I explored the idea of integer n-spheres in higher dimensions and of the intersection of multiple integer circles.

Work Experience

SoPS EDI Summer Internship (2025)
University of Liverpool

In this internship I undertook work to bring the University's maths teaching up to accessibility standards using BookML. I wrote a guide for lecturers to use to aid in their production of accessible notes, investigated the outputted notes using NVDA screen-reader and fixed bugs in this output. I also checked the accessibility of the departmental webpage and wrote guidelines on where things need to be improved here.

Undergraduate Research Internship (2024)
London Mathematical Society and University of Liverpool

Research Papers

Oleg Karpenkov, Anna Pratoussevitch, and Rebecca Sheppard. *Circumscribed Circles in Integer Geometry*. 2024. arXiv:2412.04662 [math.NT], https://arxiv.org/abs/2412.04662.

Awards

IMA National Best Maths Project: First Prize (2025)
Institute of Mathematics and its Applications

This prize is awarded to the winner of the competition which is judged by a panel of mathematicians based on a presentation on an undergraduate project. I was awarded this based on my MATH490 project.

Ronald Hudson Prize in Geometry (2025)

University of Liverpool

The Ronald Hudson Prize is awarded for excellence in examination results in Geometry in the final academic year.

Martingale Scholarship (2025)

Martingale Foundation

I was awarded a fully funded PhD position at the University of Manchester with stipend by the Martingale Foundation.

Willis Prize in Mathematics (2024)

University of Liverpool

The Willis Prize is awarded for excellence in examination results in the third academic year.

LMS Undergraduate Research Bursary (2024)

London Mathematical Society

I was awarded this bursary by the London Mathematical Society to expand my research in integer geometry.

Additional Skills

Mathematical writing using LaTeX and MetaPost.
Programming using Python, Maple, R and MATLAB.

References available on request