

## Personal details

### Personal details

**First / given name** Alan  
**Second given name**  
**Third given name**  
**Surname/family name** Sergeev  
**Date of birth** 06 February 2003  
**Preferred first/given name** Al  
**Previous surname**  
**Country of birth** Spain  
**Legal nationality** British National  
**Dual nationality**  
**Country of residence** United Kingdom  
**Have you previously studied with us at the University of Bristol?** No

## Contact details

### Home address

Please provide your permanent residential address. If you have another address and would prefer for us to contact you at that address instead you have the opportunity to add a correspondence address in the next section.

**Country** United Kingdom  
**Postcode** CB30DS  
**Address Line 1** Churchill College  
**Address Line 2**  
**City** Cambridge  
**County**  
**Telephone**

If you would like us to send any postal correspondence to an address which is not your home address please enter an alternative address here. If you want us to send correspondence to your home address then please select No.

**Do you want to add a correspondence address?** No  
**Country** United Kingdom  
**Postcode** CB30DS  
**Address Line 1** Churchill College  
**Address Line 2**  
**City** Cambridge  
**County**  
**Telephone**

## Agent

### Agent details

**Agency Name**  
**Email address**

## Other information

### Additional Documents

*Please upload required documents as outlined in your admissions statement*

### Mode of study

How would like to study this Full Time  
programme?

## Qualifications

### Qualifications

Institution	Qualification	Type	Subject	Actual/predicted	Grade	Start date	End date
University of Cambridge	First degree BA/BSC etc	Academic Qualification	Mathematics	Actual	2.i	01/Oct/2020	11/Jul/2023
University of Cambridge	Master's Degree (PG)	Academic Qualification	Mathematics	Predicted	Merit/Distincti	01/Oct/2023	15/Jul/2024

If these qualifications have altered since your last application please note the changes in the free text box here.

### English Language

Is English your first language? Yes

What is your first language?

Did you study at school/university where you were taught in English?

For how many years?

Have you sat a relevant English language test?

#### TOEFL (internet-based)

Registration number

Date of TOEFL test

TOEFL reading score

TOEFL listening score

TOEFL speaking score

TOEFL writing score

TOEFL total score

#### IELTS (International English Language Testing System)

Test report form (TRF) number

UKVI number (if applicable)

Date of IELTS test

IELTS listening score

IELTS reading score

IELTS writing score

IELTS speaking score

IELTS total score

#### Pearson Test of English

Score report code

Date of Pearson test

Pearson listening score

Pearson reading score

Pearson speaking score

Pearson writing score

Pearson overall score

#### Other English Language test

**Name of course**  
**Registration number**  
**Date of test**  
**Listening score**  
**Writing score**  
**Reading score**  
**Total score**

## Experience

### Current Employer

**Employer name and address**  
**Job title and main duties**  
**Full time/Part time**  
**Date of Appointment**  
**End date (if applicable)**

### Previous employment 1

**Employer name and address**  
**Job title and main duties**  
**Full time/Part time**  
**Date of Appointment**  
**End date (if applicable)**

### Previous employment 2

**Employer name and address**  
**Job title and main duties**  
**Full time/Part time**  
**Date of Appointment**  
**End date (if applicable)**

### Previous employment 3

**Employer name and address**  
**Job title and main duties**  
**Full time/Part time**  
**Date of Appointment**  
**End date (if applicable)**

### Other Experience

**Do you have any other relevant No**  
**work experience to support your**  
**application?**  
**Please provide details**

## Personal statement

### Personal details

Do you have a personal statement to upload? Yes  
Please type your personal statement in the box

## Research proposal

### Research proposal

Proposed supervisor 1 Misha Rudnev  
Proposed supervisor 1  
Proposed project title Topics in Geometric Combinatorics  
(max 150 chars)

## Passport and visa

### Visa required

Do you require a visa to study in the UK? No

Please fill out your passport details below. If you are unable to provide these at the current time you will have another opportunity to upload your passport after you submit the form. If you do not provide us with this information we will be unable to issue you with your confirmation of acceptance number and you will be unable to obtain a visa.

### Passport details

Passport number

### Further details

Have you previously studied in the UK?

What was the highest level of study in the UK?

Please confirm the total length of your UK study in years

## Referees

### Referee 1

Do you have a reference to upload? No

Type of reference Academic

Referee title Dr

Forename Julian

Surname Sahasrabudhe

Position Fellow

Institution/Company University of Cambridge

Email address jdrs2@cam.ac.uk

Country United Kingdom

### Referee 2

Do you have a second reference to upload? No

Type of reference Academic

Referee title Dr

Forename Paul

Surname Russel

Position Fellow

Institution/Company University of Cambridge

Email address par31@cam.ac.uk

Country United Kingdom

# Funding

## Funding 1

What is your likely source of funding? University of Bristol scholarship

Please give the name of your scholarship or Studentship  
Please specify

Percentage from this source 100

Is this funding already secured? No

## Funding 2

What is your likely source of funding?

Please give the name of your scholarship or Studentship  
Please specify

Percentage from this source

Is this funding already secured?

## Funding 3

What is your likely source of funding?

Please give the name of your scholarship or Studentship  
Please specify

Percentage from this source

Is this funding already secured?

## Other funding

I would like to be considered for other funding opportunities Yes

## Documents

Document type	File name
Transcript	Document.pdf
Research proposal	Research Proposal Bristol.pdf
Curriculum vitae	CV_2023_anon.pdf
Personal statement	personal statement brist.pdf
Transcript	Document.pdf

By ticking the checkbox below and submitting your completed online application form, you acknowledge the University of Bristol will use the information provided from time to time, along with any further information about you the University may hold, for the purposes set out in the [University's full Data Protection Statement](#). Applicants applying to the collaborative programmes of doctoral training should also read the [Data Protection Statement](#) for collaborative programmes of doctoral training.

The information that you provided on your application form will be used for the following purposes:

- To enable your application for entry to be considered and allow our Admissions Advisors, where applicable, to assist you through the application process;
- To enable the University to compile statistics, or to assist other organisations to do so. No statistical information will be published that would identify you personally;
- To enable the University to initiate your student record should you be offered a place at the University.

All applicants should note that the University reserves the right to make without notice changes in regulations, courses, fees etc at any time before or after a candidate's admission. Admission to the University is subject to the requirement that the candidate will comply with the University's registration procedure and will duly observe the Charter, Statutes, Ordinances and Regulations from time to time in force.

By ticking the checkbox below and submitting your completed online application form, you are confirming that the information given in this form is true, complete and accurate and that no information requested or other material information has been omitted. You are also confirming that you have read the Data Protection Statement and you confirm the statement below.

I can confirm that the information I have provided is true, complete and accurate. I accept that the information given in my application will be stored and processed by the University of Bristol, in accordance with the *UK General Data Protection Regulation and Data Protection Act 2018*, in order to:

- Consider my application and operate an effective and impartial admissions process;
- Monitor the University's applicant and student profile;
- Comply with all laws and regulations;
- Ensure the wellbeing and security of all students and staff;
- If my application is successful to form the basis of the statement made within my application.

If the University of Bristol discovers that I have made a false statement or omitted significant information from my application, for example examination results, I understand that it may have to withdraw or amend its offer or terminate my registration, according to circumstances.



## Education

- **Master of Mathematics (Part III)**
  - Churchill College, University of Cambridge, 2023-2024
- **Bachelor of Arts (BA) in Mathematics (Class 2.i)**
  - Churchill College, University of Cambridge, 2020-2023

## Research Experience

- **Summer Research Project (2023)**
  - *Supervisor:* Julian Sahasrabudhe
  - *Topic:* Generalization of a result in "Reconstructing a Point Set from a Random Subset of its Pairwise Distances" to higher dimensions.
  - *Outcome:* Successfully established an upper bound to a threshold probability in  $d$  dimensions. A preprint is available on arXiv: [arXiv:2401.01882](https://arxiv.org/abs/2401.01882)
  - *Presentation:* At the end of the project I presented the research at the Summer Research Festival 2023. This helped to me develop my ability to clearly and concisely articulate my own mathematical ideas.
  - *Skills:* The experience was helpful in increasing my breadth of understanding of probabilistic techniques in combinatorics, gave me invaluable experience in reading and understanding academic research papers.

## Academic Coursework

- **Current Year Courses**
  - Combinatorics
  - Ramsey Theory on Graphs
  - Introduction to Additive Combinatorics
  - Introduction to Computational Complexity
  - Extremal Combinatorics (Non-examinable)
  - Model Theory and Non-Classical Logic
  - Large Cardinals
  - Introduction to Forcing and the Continuum Hypothesis
- **Master's Thesis (Part III Essay)**
  - *Topic:* Sharp Thresholds for Ramsey Properties
  - *Supervisor:* Julian Sahasrabudhe

## Career Goals

- Dedicated to pursuing a career in academia, driven by a passion for learning mathematics and solving challenging problems.

Dear Admissions Committee,

I am writing to express my keen interest in the PhD position in extremal and probabilistic combinatorics at The University of Bristol. I graduated from the Cambridge undergraduate tripos in mathematics at Churchill College in 2023 with a 2.i grade, and subsequently secured admission to the prestigious Part III program at Cambridge, again at Churchill College. The rigorous selection process for Part III, which is contingent upon undergraduate performance, underscores the nontrivial nature of my academic achievements.

In the summer of 2023, I engaged in a research project under the supervision of Julian Sahasrabudhe. Our team successfully extended a result from the paper "Reconstructing a Point Set from a Random Subset of its Pairwise Distances" to higher dimensions. Despite encountering challenging moments, the project proved to be the most fulfilling and enjoyable summer of my academic journey, reinforcing my determination to pursue a PhD. Our work, detailed in a [preprint on arXiv](#), involved a localized bootstrap percolation process, leading to an upper bound for a threshold probability in  $d$  dimensions.

My enthusiasm for academic research is grounded in a genuine love for mathematics and a desire to contribute meaningfully to the field. My career goals align with a long-term commitment to academia, driven by the satisfaction derived from learning and problem-solving. Over the years, my passion for mathematics has only deepened, solidifying my aspiration to dedicate a substantial portion of my life to research.

In my current academic year, I am immersing myself in combinatorics courses, including Combinatorics, Ramsey Theory on Graphs, Introduction to Additive Combinatorics, and Introduction to Computational Complexity. Additionally, I am enrolled in non-examinable courses, such as Extremal Combinatorics, and foundational courses in model theory and set theory. Under the guidance of Julian Sahasrabudhe, my Master's Thesis (Part III essay) explores "Sharp Thresholds for Ramsey Properties", providing me with valuable research skills. This endeavour, coupled with my successful summer research project, has honed my ability to efficiently read and comprehend research papers, articulate complex mathematical ideas with clarity, and cultivate independent thought.

Navigating the complexities of estrangement from my abusive family due to my transgender identity posed significant emotional and financial burdens during my undergraduate years, and negatively impacted my academic performance during that time. Despite these challenges, my academic journey at Cambridge and my experiences in combinatorics and research have equipped me with the skills and mindset necessary for a successful PhD pursuit.

In conclusion, I am eager to contribute to the vibrant combinatorics research community at Lancaster and build upon my foundation in extremal and probabilistic combinatorics. I believe that my perseverance through personal challenges, along with my passion for the subject, academic achievements, and research experience, positions me as an ideal candidate for the PhD program.

Thank you for considering my application. I look forward to the opportunity to contribute to and thrive within the academic community at Bristol.

My proposed research seeks to explore novel avenues within the fields of Geometric Combinatorics, with an additional interest in aspects of Extremal and Probabilistic Combinatorics. This interest stems from my involvement in my 2023 summer research project where, under the supervision of Julian Sahasrabudhe, I contributed to extending a result in "Reconstructing a Point Set from a Random Subset of its Pairwise Distances" to higher dimensions. This experience not only deepened my understanding of probabilistic combinatorics but also exposed me to geometric combinatorics, sparking a keen interest in the latter.

While my primary areas of interest lie within Geometric Combinatorics, I am genuinely excited about the prospect of a PhD in any facet of combinatorics. My foundational training, coupled with the skills acquired through rigorous coursework and research experiences, positions me to make meaningful contributions to these fields.

I am enthusiastic about the opportunity to explore new research questions and collaborate with the faculty at the University of Bristol. Misha Rudnev's area of research aligns most closely with my interests in the already very niche area of Geometric Combinatorics. This proposed research aligns with my academic background and reflects my commitment to advancing knowledge in combinatorics.

**INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION**

<b>Surname</b>	Sergeev
<b>Forenames</b>	Alan
<b>Date of Birth</b>	06 February 2003
<b>Unique student number</b>	304917637
<b>HESA unique student identifier</b>	2011149176378

**DEGREES AWARDED**

No degree awarded.

**INFORMATION IDENTIFYING THE QUALIFICATION(S)**

<b>Name and status of awarding institution</b>	University of Cambridge
<b>College</b>	Churchill College
<b>Name of Qualification</b>	MMath & BA Degrees
<b>Level of Qualification</b>	Undergraduate (Full-Time)
<b>Main field(s) of study for the qualification</b>	Mathematical Tripos
<b>Official Length of Programme</b>	Four Years
<b>Course Start Date</b>	Michaelmas Term 2020 (01 October 2020)
<b>Language of Instruction and Examination</b>	English

**ACADEMIC RECORD**

(\*) denotes no marks recorded for this unit

**Overall result for the degree of Bachelor of Arts:** Class II, division 1

For information on how the overall degree result is calculated please refer to website  
<https://www.camdata.admin.cam.ac.uk/degree-classes>

**EASTER TERM 2021**

Mathematical Tripos, Part IA

Result : Class II, division 2

Overall Mark : 52/100

<b>The examination included the following components:</b>	<b>Result</b>
COVID : COVID-19: in the academic year 2020-21 this candidate may have undertaken alternative assessments. Information about the impact on assessments and the action taken by the University is available here: <a href="https://www.camdata.admin.cam.ac.uk/">https://www.camdata.admin.cam.ac.uk/</a>	*
1 : Paper 1	*
2 : Paper 2	*
3 : Paper 3	*
4 : Paper 4	*

Grade Boundaries:	Result
Class I/Class II, division i	70
Class II, division i/Class II, division ii	60
Class II, division ii/Class III	50
Class III/Fail	40
The examinations for the Mathematical Tripos cover all subjects in combined papers and are not modular. It is not possible to give comparable marks for individual subjects. The transcript percentage is calculated by suitable scaling from the overall merit mark total: it represents the student's achievement across all subjects taken in the relevant year.	

### EASTER TERM 2022

Mathematical Tripos, Part IB

Result : Class II, division 1

Overall Mark : 60/100

The examination included the following components:	Result
CP : Computational Project	*
1 : Paper 1	*
2 : Paper 2	*
3 : Paper 3	*
4 : Paper 4	*

Grade Boundaries:	Result
Class I/Class II, division i	70
Class II, division i/Class II, division ii	60
Class II, division ii/Class III	50
Class III/Fail	40
The examinations for the Mathematical Tripos cover all subjects in combined papers and are not modular. It is not possible to give comparable marks for individual subjects. The transcript percentage is calculated by suitable scaling from the overall merit mark total: it represents the student's achievement across all subjects taken in the relevant year.	

### EASTER TERM 2023

Mathematical Tripos, Part II

Result : Class II, division 1

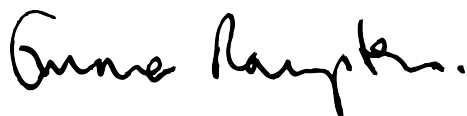
Overall Mark : 64/100

The examination included the following components:	Result
CP : Computational Project	*
1 : Paper 1	*
2 : Paper 2	*
3 : Paper 3	*
4 : Paper 4	*

Grade Boundaries:	Result
Class I/Class II, division i	70
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Class III	40
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## **CERTIFICATION OF THE DOCUMENT**

**Signature**



**Date:** 08-December-2023

**Title of Office:** Registry

## **FURTHER INFORMATION**

For further information please refer to the programme specification at

<http://www.admin.cam.ac.uk/univ/camdata/archive.html>

Where available, this will contain information on:

- Access Requirements
- Professional Status
- Programme Requirements
- Grading Schemes and Degree Classification
- Access to further study

## **INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM**

Programme specifications as found on : <http://www.admin.cam.ac.uk/univ/camdata/archive.html> for all courses include an indication of the level of the course in the context of the *Framework for Higher Education Qualification in England, Wales and Northern Ireland* , published by the Quality Assurance Agency (QAA). Full descriptors of the levels of the *Framework* can be viewed on the QAA website : <http://www.qaa.ac.uk/quality-code>

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**EASTER TERM 2021**

Mathematical Tripos, Part IA

Result : Class II, division 2

Overall Mark : 52/100

<b>The examination included the following components:</b>	<b>Result</b>
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1 : Paper 1	*
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3 : Paper 3	*
4 : Paper 4	*



Grade Boundaries:	Result
Class I/Class II, division i	70
Class II, division i/Class II, division ii	60
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The examinations for the Mathematical Tripos cover all subjects in combined papers and are not modular. It is not possible to give comparable marks for individual subjects. The transcript percentage is calculated by suitable scaling from the overall merit mark total: it represents the student's achievement across all subjects taken in the relevant year.	

### EASTER TERM 2022

Mathematical Tripos, Part IB

Result : Class II, division 1

Overall Mark : 60/100

The examination included the following components:	Result
CP : Computational Project	*
1 : Paper 1	*
2 : Paper 2	*
3 : Paper 3	*
4 : Paper 4	*

Grade Boundaries:	Result
Class I/Class II, division i	70
Class II, division i/Class II, division ii	60
Class II, division ii/Class III	50
Class III/Fail	40
The examinations for the Mathematical Tripos cover all subjects in combined papers and are not modular. It is not possible to give comparable marks for individual subjects. The transcript percentage is calculated by suitable scaling from the overall merit mark total: it represents the student's achievement across all subjects taken in the relevant year.	

### EASTER TERM 2023

Mathematical Tripos, Part II

Result : Class II, division 1

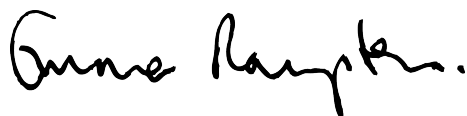
Overall Mark : 64/100

The examination included the following components:	Result
CP : Computational Project	*
1 : Paper 1	*
2 : Paper 2	*
3 : Paper 3	*
4 : Paper 4	*

Grade Boundaries:	Result
Class I/Class II, division i	70
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Class II, division ii/Class III	50
Class III	40
<p>The examinations for the Mathematical Tripos cover all subjects in combined papers and are not modular. It is not possible to give comparable marks for individual subjects. The transcript percentage is calculated by suitable scaling from the overall merit mark total: it represents the student's achievement across all subjects taken in the relevant year.</p>	

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UNIVERSITY OF  
CAMBRIDGE

Faculty of Mathematics

Department of Pure Math.  
and Math. Stats. (DPMMS)  
Center for Mathematical Sciences,  
University of Cambridge  
Wilberforce Road,  
Cambridge CB3 0WA,  
United Kingdom

January 5, 2024

To the selection committee,

I am writing in support of Al Sergeev for a PhD place at Bristol University. Al has shown enthusiastic dedication in studying graph theory and has done well in a summer research project, supervised by myself, which resulted in a nice research paper that I expect will be published in a mid-range combinatorics journal.

I first met Al when he attended my part II graph theory course, where he was quite enthusiastic very involved with the material. Moreover I found that was reading well beyond the examinable contents of the course. His enthusiasm continued when he took my part III course “Ramsey theory on Graphs” and, in particular, presented a very nice solution to a challenging problem regarding the, so called, online Ramsey numbers.

I got to know Al’s mathematical abilities best during the summer of 2023 when he was one of three students which I supervised for a summer research project. My approach with summer students is generally to work with a light touch allowing their ideas to guide the discussion. I start by setting them up with a problem and then try to intervene minimally, generally just when they are headed in a “weird” direction and when they are writing up. For the summer I also had the help of Julien Portier and Jan Petr, PhD students in Cambridge, who also dropped into to discuss the problems with the students.

For the summer, I gave the students two problems: a probabilistic problem in number theory and a problem on reconstructing point sets in  $\mathbb{R}^d$ , given the distances between a random selection of pairs. While the students decided the first problem was a bit too difficult fairly early on, they did ultimately make

very nice progress on the second of the two problems, which I will try to describe here in a little more detail. Let  $d \in \mathbb{N}$  be fixed, and let  $X \subset \mathbb{R}^d$  be a finite set  $|X| = n$  and say we are given the distance between each distinct  $x, y \in X$  with probability  $p \in (0, 1)$ . For which  $p$  can we determine  $X$  up to isometry, with high probability? For technical reasons this is not *quite* the correct problem and one really is interested in constructing *almost all* of  $X$  up to isometry.

This problem was first raised by Benjamini and Tzalik who proved some nice results in the  $d = 1$  case before the problem was just about completely settled, in the  $d = 1$  case, by Girão, Illingworth, Michel, Powierski and Scott. The problem the students set out to study was the inciting problem for larger dimensions, where the approach of the previous authors completely breaks down and where nothing was known before. Along with Portier and Peter, the students managed to show that if  $p > n^{-2/(d+4)}$  then we can determine  $X$  up to isometry, with high probability.

Their methods are very different from previous work and instead relate the problem to “graph bootstrap percolation”. However this does not take care of all cases, and they need subtle induction to take care of the other cases. The paper is available on arXiv (2401.01882) and will likely be accepted at a mid-level combinatorics journal such as *Journal of Graph Theory*.

Al had a good amount of creative input into these projects and did quite a bit of work in writing the projects up. Overall I would say that Al is reasonably well suited for a PhD position and should be given the opportunity to continue his work.

Kind regards,

Julian Sahasrabudhe  
 University Assistant Professor,  
 Depart. of Pure Math. and Math. Stats (DPMMS)  
 University of Cambridge  
 jdrs2@cam.ac.uk

## REFERENCE FOR ALAN SERGEEV

Alan Sergeev has been at Churchill College in the University of Cambridge since October 2020, studying initially for the B.A. (Hons) and now for the M.Math. degree in mathematics. I have taught him in a group of two students for courses in his first year on Introductory Pure Maths (elementary number theory, sets, functions, countability) and Probability, and in his third year on Graph Theory. Since April 2022, I have been his Director of Studies (academic advisor) in which capacity I have access to his examination results and reports from everyone who has taught him.

The year-group in the University in mathematics is around 250 students. In June 2021, Alan passed his first-year exams with a 2.2 ranked 215th. In June 2022, he passed his second-year exams with a 2.1, ranked 165th. In June 2023 he passed his third-year exams with a 2.1 ranked 115th. His strongest courses in the examination were Graph Theory, and Logic and Set Theory; we do not have a modular examination system, making it difficult to quote meaningful results on individual courses, but on each of these two courses he achieved three out of four possible 'alphas' indicating substantially complete solutions to long questions (with the target for examiners being around 40% of attempts at a question should achieve an alpha) so I would rate his examination performance on these two courses as being what I would expect of a student in the first class. This would allow him to graduate with the B.A. (Hons) degree, but in line with standard practice he has postponed graduation to continue for a fourth year leading to the M.Math. (Part III of the Mathematical Tripos in local terminology). He is specialising this year in combinatorics and foundations (logic and set theory). Given his previous trajectory and his achievement in the two most relevant courses last year, I think he has a good chance of a distinction, equivalent to a top-half first.

My impression is that Alan is on an upward trajectory at present. Reports from his supervisors in second year seemed consistent with his second-year results, with predictions from supervisors averaging around 2.1 and ranging from 2.1/2.2 up to 1/2.1. In the third year they were markedly better, with the nine supervisors who provided an estimate giving seven of 1, one of 1/2.1 and one of 2.1. My own experience was that in the final course I supervised him for, third-year Graph Theory, Alan's work was the best I have seen from him, leading me to predict a 1st on that course. He appeared to have found an area in which he had a significant interest and had a full understanding of the course. His work on problems was good throughout, including on some of the more difficult material, which I found impressive as it is a course where there is a lot of scope to set challenging problems and he was able to come up with solutions to many of these that required a fair amount of ingenuity and were not solved by many students.

Overall, I think the reasons for this are that he's always been bright but both took a while to settle into a university level maths course, and I understand also had some disruption to his work in the second year for personal reasons during the period when I was on leave. This left him in June 2022 feeling a bit underprepared for his final year, so he took some advice and then re-visited the relevant second year courses independently over the summer, where he seemed both to start enjoying them more and getting properly to grips with the material. Since his return for third year in October 2022 he seems to have been thriving. He completed a summer research project on Graph Theory in Summer 2023 with Julian Sahasrabudhe (whom I believe to be writing separately). In his work this academic year, it is clear to me that he has found an area in which he has a deep interest and is certain he wants to continue to a research degree on related material.

I think he should be a very good prospect as a research student as his work has continually improved over the years. From what I saw of him in the most relevant third-year course, Graph Theory, by that point he was certainly working at a level comparable with that of students I have seen in the past who have gone on to successful combinatorics PhDs and beyond, and his level of enthusiasm for the subject is as high as I've seen so I think he will work hard. He therefore comes with my strong recommendation.

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