

## Personal details

### Personal details

**First / given name** Allan  
**Second given name**  
**Third given name**  
**Surname/family name** Perez  
**Date of birth** 30 September 2000  
**Preferred first/given name** Allan  
**Previous surname**  
**Country of birth** Ecuador  
**Legal nationality** Ecuadorian  
**Dual nationality** Spanish  
**Country of residence** Spain  
**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** Spain  
**Postcode** 08940  
**Address Line 1** Avinguda Sant Ildefons 12  
**Address Line 2** Bj 4  
**City** Barcelona 08940  
**County** Barcelona  
**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?** Yes  
**Country** United Kingdom  
**Postcode** OX1 3BW  
**Address Line 1** Catte Street  
**Address Line 2**  
**City** Oxford  
**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 Glasgow	First degree BA/BSC etc	Academic Qualification	Mathematics	Actual	First Class Hon	20/Sep/2019	26/Jun/2023
University of Oxford	Master's Degree (PG)	Academic Qualification	Mathematics	Predicted	Distinction	01/Sep/2023	27/Jun/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? No

What is your first language? Spanish

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

For how many years? 4

Have you sat a relevant English language test? No

#### 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** Core PD Unit J2 Glasgow North Trading Estate, 24 Craigmont Street, Glasgow, Lanarkshire, G20 9BT  
**Job title and main duties** Software engineering. Developing a prototype of a toy with some ESP32 and variants models. I was in charge of live-modulating an arbitrary number of channels, and developing an ML model for gesture recognition for various games.  
**Full time/Part time** Part time  
**Date of Appointment** 22 March 2022  
**End date (if applicable)** 21 August 2023

### 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 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 Tim Dokchitser  
Proposed supervisor 1 Celine Maistret  
Proposed project title Algebra and Number theory  
(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 Professor

Forename Alex

Surname Bartel

Position Professor

Institution/Company University of Glasgow

Email address alex.bartel@glasgow.ac.uk

Country United Kingdom

### Referee 2

Do you have a second reference to upload? No

Type of reference Academic

Referee title Dr

Forename Efthymios

Surname Sofos

Position Lecturer

Institution/Company University of Glasgow

Email address efthymios.sofos@glasgow.ac.uk

Country United Kingdom

# Funding

## Funding 1

What is your likely source of funding? Scholarship

Please give the name of your scholarship or Studentship Heilbronn Doctoral Partnership  
Please specify

Percentage from this source 100

Is this funding already secured? No

## Funding 2

What is your likely source of funding? Scholarship

Please give the name of your scholarship or Studentship Martingale Scholarship  
Please specify

Percentage from this source 100

Is this funding already secured? No

## 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
Degree certificate	uog_certificate.pdf
Transcript	UOG_HEAR.pdf
Research proposal	essay.pdf
Transcript	Allan_Perez.pdf
Curriculum vitae	cv_anonymous.pdf
Personal statement	personal_statement.pdf
Degree certificate	Allan_Perez.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.



# Anonymous

## Curriculum vitae

Anonymous  
Anonymous

### Education

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<b>University of Oxford</b> <i>MSc. Mathematical Sciences</i>	<b>2023 – 2024*</b> <i>Oxford, England, UK</i>
<b>University of Glasgow</b> <i>BSc. Mathematics – Honours of the first class</i>	<b>2019 – 2023</b> <i>Glasgow, Scotland, UK</i>
<b>Penn Foster High School</b> <i>Online high school diploma</i>	<b>2016 – 2018</b> <i>Barcelona, Spain</i>

### Research Experience

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<b>Mathematics Research Intern</b> <i>University of Glasgow</i> <ul style="list-style-type: none"><li>Eight week summer research project funded by the London Mathematical Society and supervised by Prof. Alex Bartel.</li><li>Numbers can be extended into particular sets of complex numbers that behave in a similar way to the rational numbers, and in particular these sets have a specific subset that looks like the integers. These integers will sometimes fail to factorise uniquely, and sometimes not, in the most strange of the patterns. These patterns can be studied with algebraic methods that throw light into the structure and symmetries that lie beneath, and is necessary to understand in order to solve Diophantine equations, like elliptic curves.</li><li>Key words: Field extensions, Groups, Rings, Ideals, Modules, Noetherian and Dedekind Domains.</li></ul>	<b>July 2022 – August 2022</b> <i>Glasgow, Scotland, UK</i>
<b>Physics Research Intern</b> <i>University of Glasgow</i> <ul style="list-style-type: none"><li>Eight week summer project in the Extreme Light research group.</li><li>Passing a light ray of the right frequency through a diffusive material can give information about what lies inside the material. Diffuse optical imaging aims to study the behaviour of this system by modelling photons as a diffusive system, like heat. This method loses information as the material gets thicker, but by looking at extra features of the perceived diffuse pattern, reconstructions can be improved.</li><li>Key words: Information theory, computational methods to solve PDEs, Python scientific programming, diffuse optics.</li></ul>	<b>July 2021 – August 2021</b> <i>Glasgow, Scotland, UK</i>

### Employment

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<b>Software Engineer (Part-Time)</b> <i>PD Group</i> <ul style="list-style-type: none"><li>Working with micro controllers, audio systems, real time operating systems, and machine learning.</li></ul>	<b>March 2022 – August 2023</b> <i>Glasgow, Scotland, UK</i>
<b>Mathematics Tutor</b> <i>Caledonia Tutors</i> <ul style="list-style-type: none"><li>Tutoring National 5, Higher, and Advanced Highers mathematics.</li></ul>	<b>January 2022 – July 2023</b> <i>Glasgow, Scotland, UK</i>
<b>Software Engineer (Part-Time)</b> <i>Glasgow University Software Service</i> <ul style="list-style-type: none"><li>Tech consultancy for external companies. Working with micro controllers until transfer to PD Group.</li></ul>	<b>December 2021 – March 2022</b> <i>Glasgow, Scotland, UK</i>
<b>Bike Messenger</b> <i>Self-Employed</i> <ul style="list-style-type: none"><li>Bike delivering services, through Deliveroo and others.</li></ul>	<b>February 2021 – December 2021</b> <i>Glasgow, Scotland, UK</i>

**Web Developer**

November 2019 – June 2021

*Self-Employed**Glasgow, Scotland, UK*

- Web development, mainly with WordPress. Building task-specific plugins for the client's needs, including data-pipelines through different platforms, custom maps development, marketing tasks automation, among others.
- Key words: PHP 7.x, JavaScript, CSS/SASS, Git, Flywheel, GeoJSON, ACF, React, VueJS, GatsbyJS, Static Site Generators, Vagrant, SSH, Site hosting.

**CTO**

January 2019 – September 2019

*Suprive Media**Barcelona, Spain*

- Responsible of the tech side of a digital marketing firm that was just starting.
- Design and optimization of workflow, including testing and deployment.
- Management of the development, maintenance, and security of websites and applications.

**Software Developer**

August 2017 – February 2018

*Self-Employed**Barcelona, Spain*

- Development of trading systems and data analysis for retail traders.
- Basic web development and tech consultancy for small businesses and freelancers.

**Junior Quant Analyst**

August 2017 – February 2018

*Nexow Systems**Barcelona, Spain*

- Signal recognition for high frequency trading and asset allocation.
- Main focus on foreign exchange markets.
- Specialized research of machine learning algorithms, including various architectures of neural networks and reinforcement learning.

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*Other Experience***Propulsion Team Member**

Feb, 2020 – Jun, 2020

*Glasgow University Rocketry Society**Glasgow, Scotland, UK*

- Web development with Ruby/Jekyll, Bootstrap, Netlify, Git.
- Igniter research and early design. With Longhorn Rocketry Association's simulators for hybrid rocket engines, I programmed simulations for nozzle and combustion tank designs.

**Software Team Member**

Feb, 2020 – Jun, 2020

*Glasgow University Orbit Society**Glasgow, Scotland, UK*

- Web development with VueJS SPA, Bootstrap, Heroku, Git.
- The main project was CloudView, with the goal of sending a jetson-nano with a camera to a suborbital flight on a weather balloon in order to do on-board real-time cloud segmentation. We got a prize for the best business pitch in the terra-Nova hackathon in Edinburgh.
- Volunteer for an outreach event for high school students.

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*Awards and Achievements***Martingale Scholar – Fully funded graduate studies at University of Oxford***Martingale Foundation*

2023

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*Selected Certifications***Hyperparameter tuning, Regularization and Optimization**

Credential ID: 4696FYH2MGUT

*Coursera*

2020

**Structuring Machine Learning Projects**

Credential ID: F59J54E2YR6A

*Coursera*

2020

**Neural Networks and Deep Learning**

Credential ID: BTJPH5P8439A

*Coursera*

2020

Software Engineering, Algorithms, Databases

Platzi

2018

Machine Learning, SK-Learn, Backpropagation

Platzi

2018

*Specialized Skills*

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**Programming Languages:** Python (advanced), C/C++ (advanced), JavaScript (intermediate), C# (intermediate), Ruby (beginner).

**Markup Languages:** HTML (advanced), L<sup>A</sup>T<sub>E</sub>X(advanced), Markdown (advanced).

**Computational Algebra:** Sage (beginner), Mathematica (beginner).

**Operating Systems:** Linux (intermediate).

**Software engineering tools:** Git/GitHub (advanced), Shell (intermediate/advanced),

Vagrant/VirtualBox (intermediate), GCC/GDB (intermediate), SSH (intermediate),

Tensorflow/Keras (intermediate), Numpy/Scipy/Matplotlib (advanced), tmux/vim (advanced).

Original Award  
£18.00




V N I V E R S I T A T I S   G L A S G V E N S I S   S E N A T V S


*Noueritis omnes Almam Vniuersitatem Glasguensem alumnum suum*

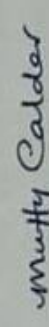
*Allan Steven Perez Murillo*

*Scientiae Baccalaureum  
cum honoribus primae classis*

*ita creasse ut omnibus priuilegiis quae ad hunc gradum pertinent iure  
uteretur. In quorum fidem his litteris commune Vniuersitatis sigillum  
apponendum curabamus. Dabamus Glasgae in aedibus academicis  
anno salutis mmmxiii die xxiii mensis iunii*

  
Principalis

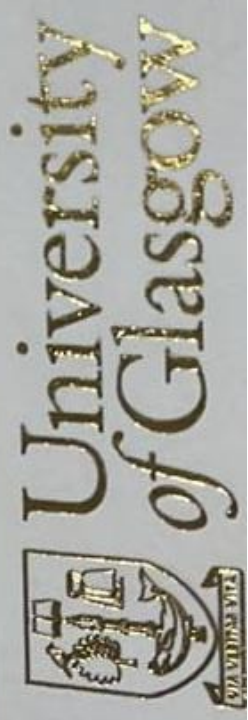
  
Senator Academicus Scriba

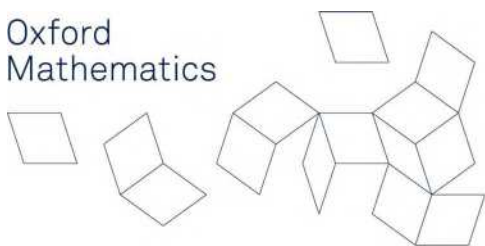
  
Rector Collegii Scientiae Naturalis et  
Machinalis

*This document attests that the person named hereon has satisfied  
the requirements of the Senate of the University of Glasgow for  
the award on Twenty Third Day of June Two Thousand and Twenty Three of the degree of  
Bachelor of Science (B.Sc.) in Mathematics  
with Honours of the First Class*

2480326

This document should be read in conjunction with the Higher Education Achievement Report (HEAR), European Diploma Supplement (EDS) or Academic Transcript





11th December 2023

To Whom It May Concern

**Re: Allan Perez – MSc in Mathematical Sciences**

I am writing to confirm that Allan Perez is enrolled in the full time MSc in Mathematical Sciences running from 1<sup>st</sup> October 2023 to 30<sup>th</sup> June 2024 at the Mathematical Institute, University of Oxford. All assessment takes place at the end of the course and so no marks, and hence no official transcript, are available yet. Students are required to complete six lecture courses and a double unit dissertation in order to complete the MSc. There is also the possibility of taking one or two extra lecture courses. Students will make the final decision on which courses to be assessed on part way through the second term.

Further information about the student:

Teaching institution:	University of Oxford, Mathematical Institute
College:	Hertford College
Mode of attendance:	Full-time
Lecture courses (term 1):	Homological algebra Algebraic geometry Modular forms Differential geometry

Provisional lecture courses (term 2):

Dissertation topic:	Torsion of elliptic curves and abelian varieties
Dissertation supervisor:	Aleksander Horawa

Please do not hesitate to get in touch by emailing [kathryn.gillow@maths.ox.ac.uk](mailto:kathryn.gillow@maths.ox.ac.uk) if there is any further information I can provide.

Yours faithfully,

Dr Kathryn Gillow  
Course Director for the MSc in Mathematical Sciences

# 1 Statement of purpose

In mathematics research I find a vocation that presents intricate puzzles to fundamental questions, providing me with a sense of satisfaction and delight akin to engaging in a game. This experience unfolds into a genuine feeling of freedom, a rare quality that distinguishes it from other career paths I have had the fortune to explore, namely software engineering and digital marketing. This sentiment guided me to a distinct fascination with inquiries within the realms of algebraic number theory and its interactions with algebraic geometry, inspired by the guidance and mentorship I received in my undergraduate degree from Prof. Alex Bartel. Pursuing doctoral studies in these areas is the logical progression in line with my current passions.

In my academic journey, marked by a modestly successful mathematics undergraduate degree, I've demonstrated resilience and unwavering determination. Balancing part-time employment throughout my studies, a necessity arising from a low-income background, instilled in me an unyielding commitment to academic pursuits. Amidst the diverse array of mathematical subjects explored during my undergraduate years, algebra and, subsequently, algebraic number theory emerged as captivating focal points. The attitude of seeking profound understanding and deep connections resonated more with me in these areas than in others that demanded a more pragmatic and model-fitting approach, as I encountered in my early experimental physics summer research project. Prof. Alex Bartel played a crucial role, offering not just academic guidance and exceptional teaching but also igniting my passion for these domains. Specifically, he supervised my undergraduate dissertation on the finiteness of the class group using Minkowski's convex body theorem, solidifying my growing interest in algebraic number theory. This particular theorem stands out among those that I find exciting.

Specific questions and topics have captured my attention and fuelled my ambitions. The average behaviour of class groups and ongoing efforts to extend Cohen-Lenstra heuristics beyond quadratic to general number fields, as well as the deeply intricate but promising conjectures of Langlands and the extensive programme around it, particularly in the global fields case, serve as intellectual milestones I aim to explore. Beyond these, the mysteries surrounding torsion points of abelian varieties of genus higher than one, as exemplified by the torsion conjecture, or the intricate behaviour of dessin d'enfants on compact Riemann surfaces covering  $\mathbb{P}^1$  and their permutations induced by the absolute Galois group's action on the polynomials describing these covers, all beckon for exploration. The extension of singular moduli theory to real quadratic case and a prospective Galois theory of transcendental numbers, a conjectured theory of Grothendieck, form the horizon of my academic curiosity.

My master's coursework at Oxford, made possible through a scholarship from the Martingale Foundation, is providing a foundational understanding, which I consider essential for addressing the mentioned problems, through courses on modular forms, homological algebra, algebraic geometry, and differentiable manifolds, where I chiefly learned about finite dimensional normed vector space structure on modular forms of

fixed weight and the derived Hecke operators and their algebras; about Ext and Tor derived functors and group (co)homology; about quasi projective varieties and their function fields, birational equivalence and blow ups; about the foundational theory of manifolds, exterior algebras, de Rham cohomology, and Stokes' theorem. Next term I hope to take courses on schemes and elliptic curves, as well as audit Riemannian geometry and representation theory of semisimple Lie algebras. Alongside, I will be writing an essay on Mazur's isogeny theorem for elliptic curves, which implies the classification of torsion groups of rational elliptic curves, a result Mazur previously established through alternative methods.

In conclusion, my journey towards a Ph.D. at Bristol is not just a pursuit of academic excellence but a quest for intellectual fulfilment. With a formal yet humble demeanour, I aspire to contribute to the rich legacy of the University's mathematical community. The allure of eternal questions, the resonance of number theoretical explorations, and the richness and interdisciplinarity of Bristol's mathematical institute converge to shape my vision of a meaningful and impactful academic journey.

# 1 Research Statement

I am primarily interested in algebraic number theory and its interactions with algebraic geometry. In my undergraduate dissertation, I had the opportunity to explore fundamental concepts like number fields and the class group, and to examine a very aesthetically pleasing proof of the finiteness of this group. This sparked my interest in this area and led me to my current endeavour of master's studies, specialising in topics such as algebraic geometry, homological algebra, modular forms, and elliptic curves. I am nurturing this spark with my master's essay on Mazur's isogeny theorem, which I use to understand the classification of torsion of rational elliptic curves, and more broadly, of elliptic curves over number fields.

Looking forward, specific questions and topics have captured my attention and fuelled my ambitions. The average behaviour of class groups and ongoing efforts to extend Cohen-Lenstra heuristics beyond quadratic to general number fields, as well as the deeply intricate but promising conjectures of Langlands and the extensive programme around it, particularly in the global fields case, serve as intellectual milestones I aim to explore. Moreover, the mysteries surrounding abelian varieties and their torsion, as exemplified by the uniform boundedness conjecture, or the relation of torsion points with the endomorphism rings of these varieties, all beckon for exploration. Furthermore, the more arithmetical problems surrounding genus one, such as the questions about its rank and the rich theory surrounded by the BSD conjecture and the approaches from Iwasawa theory through the study of the Tate-Shafarevich group, are problems that have captured my imagination. Exploring these questions naturally led to problems of computational nature, and because of this, I would like to highlight that my background in software engineering might be an asset, particularly my familiarity with problems of algorithmic nature and general programming skills.

The University of Bristol seems to be the right choice for doctoral studies because of its strong expertise in the aforementioned areas, as evidenced by the strong research output of faculty such as Prof. Tim Dokchitser, Dr. Celine Maistret, and Dr. Alice Pozzi, all of whom are attractive PhD supervisors since they concern themselves with questions aligned with the aforementioned ones. Moreover, the rich and interdisciplinary profile of its mathematical institute and its celebrated reputation make it more appealing. Additionally, the prospect of continuing the Martingale scholarship, of which I am a recipient at the University of Oxford, for doctoral studies at the University of Bristol enhances both the attractiveness and convenience of the programme.



# Higher Education Achievement Report

(incorporating European Diploma Supplement)



## 1 Personal Information

Family Name(s)	Perez Murillo
Given Name(s)	Allan Steven
Date of Birth	30/09/2000
Student ID	2480326
HESA ID	1911683401970

## 2 Qualification Achieved

Name of Qualification	Bachelor of Science
Date of Completion (The date at which a Board of Examiners confirms the result)	16/06/2023
Award Date (The date on which the award is conferred)	23/06/2023
Classification	with Honours of the First Class
Endorsements	None
Main Fields of Study	Mathematics
Awarding Institution	University of Glasgow
Language of Institution	English
Language of Instruction and Assessment	English

## 3 Qualification Level

Level of Qualification	UG Honours
National Qualification Framework Level	Level 10
Length of Programme (normally)	4 Years
Access Requirements	<p>The University's prospectus provides an indication of current entry requirements for this degree or award, see: <a href="http://www.gla.ac.uk/prospectuses/undergraduate/">http://www.gla.ac.uk/prospectuses/undergraduate/</a> <a href="http://www.gla.ac.uk/prospectuses/postgraduate/">http://www.gla.ac.uk/prospectuses/postgraduate/</a> <a href="http://www.gla.ac.uk/research/opportunities/">http://www.gla.ac.uk/research/opportunities/</a> Information on entry requirements for previous awards is available from the Recruitment &amp; International Office, for contact details see: <a href="http://www.gla.ac.uk/services/rio/">http://www.gla.ac.uk/services/rio/</a></p>

## 4 Mode of study, Programme requirements and results gained

### 4a Mode and location of study

Academic Year 2019-20	Full-Time - University of Glasgow
Academic Year 2020-21	Full-Time - University of Glasgow
Academic Year 2021-22	Full-Time - University of Glasgow
Academic Year 2022-23	Full-Time - University of Glasgow

### 4b/c Programme Requirements/Specification

<p>Details of Programme requirements and specifications can be found at the following link: <a href="http://www.gla.ac.uk/services/senateoffice/programmesearch/">http://www.gla.ac.uk/services/senateoffice/programmesearch/</a> - please note that, in the case of exit awards, your search should be conducted using the original degree programme, as exit awards do not have their own specification documents. Programme specifications are published annually, please refer to the document published in the final session of study - see 4a above. Programme Specifications are not available for research degrees</p>
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# Higher Education Achievement Report

(incorporating European Diploma Supplement)



## 4d Record of Learning and Achievement

### Academic Year 2019-20

Programme		Bachelor of Science		Academic Year 2019-20				
Main Field(s) of Study		Theoretical Physics						
Course		Description	Level	Credits	ECTS Credits	Grade	Grade Points	
ENG	1021	Electronic Engineering 1X	7	20	10	B3	15	
ENG	1022	Electronic Engineering 1Y	7	20	10	CA	-	
MATHS	1017	Mathematics 1	7	40	20	CA	-	
PHYS	1001	Physics 1	7	40	20	CA	-	

### Academic Year 2020-21

Programme		Academic Year 2020-21						
Main Field(s) of Study		Bachelor of Science		Level	Credits	ECTS Credits	Grade	Grade Points
		Mathematics and Physics						
Course		Description						
MATHS	2001	Mathematics 2A: Multivariable Calculus		8	10	5	A3	20
MATHS	2004	Mathematics 2B: Linear Algebra		8	10	5	A3	20
MATHS	2032	Mathematics 2C: Introduction To Real Analysis		8	10	5	A5	18
MATHS	2033	Mathematics 2D: Mathematical Methods and Modelling		8	10	5	A1	22
MATHS	2034	Mathematics 2E: Mechanics		8	10	5	A3	20
MATHS	2035	Mathematics 2F: Groups, Transformations and Symmetries		8	10	5	B2	16
PHYS	2001	Physics 2		8	60	30	A2	21

### Academic Year 2021-22

Programme		Bachelor of Science		Academic Year 2021-22				
Main Field(s) of Study		Mathematics						
Course		Description	Level	Credits	ECTS Credits	Grade	Grade Points	
MATHS	4072	3H: Algebra	10	20	10	A3	20	
MATHS	4073	3H: Analysis of Differentiation and Integration	10	10	5	A1	22	
MATHS	4074	3H: Dynamical Systems	10	10	5	A3	20	
MATHS	4075	3H: Mathematical Methods	10	20	10	A1	22	
MATHS	4076	3H: Methods in Complex Analysis	10	10	5	B2	16	
MATHS	4077	3H: Metric Space and Basic Topology	10	20	10	A2	21	
MATHS	4078	3H: Mechanics of Rigid and Deformable Bodies	10	20	10	A4	19	
MATHS	4079	3H: Writing and Presenting Mathematics	10	10	5	A1	22	

### Academic Year 2022-23

Programme		Bachelor of Science		Academic Year 2022-23				
Main Field(s) of Study		Mathematics						
Course		Description	Level	Credits	ECTS Credits	Grade	Grade Points	
MATHS	4061P	Mathematics Project 4	10	20	10	A5	18	
MATHS	4101	4H: Differential Geometry	10	20	10	A3	20	
MATHS	4103	4H: Functional Analysis	10	20	10	A3	20	
MATHS	4105	4H: Galois Theory	10	10	5	A5	18	
MATHS	4108	4H: Number Theory	10	10	5	A2	21	
MATHS	4111	4H: Topics in Algebra	10	10	5	B2	16	
MATHS	4112	4H: Algebraic and Geometric Topology	10	20	10	A3	20	
MATHS	4116	4H: Measure Theory and Probability	10	10	5	A1	22	

**Final Award of Bachelor of Science, with Honours of the First Class**

**Awarded on 23 June 2023**

## Higher Education Achievement Report

(incorporating European Diploma Supplement)



### 5 Qualification - Function and Access to Further Study

This qualification may allow access to further study (at SCQF Level 11 or 12) subject to the individual requirements of the institution concerned.

The following professional bodies or institutions have accredited this qualification:

#### BSc Honours in Mathematics

Institute of Mathematics and its Applications

<http://www.ima.org.uk/>

### 6 Additional Achievements

Students at the University of Glasgow have the opportunity to engage in extra-curricular activities which may contribute to the life of the University and the wider community as well as to their own personal and professional development. The achievements reported here have been verified by the University of Glasgow.

Formal verified records of additional achievements were first collected for academic session 2011-12. Achievements prior to this will not show here.

None Verified

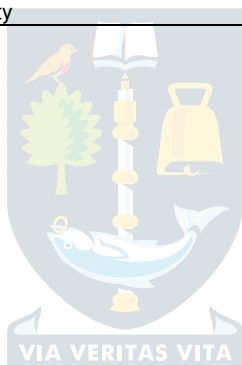
### 7 Certification

Date of Transcript 19/06/2023

Authentication

Capacity

Head of the Registry



University  
of Glasgow

**GUIDE TO UNIVERSITY OF GLASGOW  
HIGHER EDUCATION ACHIEVEMENT REPORT  
(INCORPORATING EUROPEAN DIPLOMA SUPPLEMENT)  
UNDERGRADUATE AND TAUGHT POSTGRADUATE RESULTS**

**CODE OF ASSESSMENT SCHEDULE A COURSES<sup>1</sup>**

CODE	PRIMARY GRADE	SECONDARY BAND	GLOSS
A1	A	1	Excellent
A2	A	2	Excellent
A3	A	3	Excellent
A4	A	4	Excellent
A5	A	5	Excellent
B1	B	1	Very Good
B2	B	2	Very Good
B3	B	3	Very Good
C1	C	1	Good
C2	C	2	Good
C3	C	3	Good
D1	D	1	Satisfactory
D2	D	2	Satisfactory
D3	D	3	Satisfactory
E1	E	1	Weak
E2	E	2	Weak
E3	E	3	Weak
F1	F	1	Poor
F2	F	2	Poor
F3	F	3	Poor
G1	G	1	Very Poor
G2	G	2	Very Poor
H	H		

In the case of non-honours courses where schools do not hold records both of primary and secondary bands results may appear in the form A, B, C etc.

**CODE OF ASSESSMENT SCHEDULE B COURSES<sup>1</sup>**

CODE	PRIMARY GRADE	DESCRIPTION
A0	A	Excellent
B0	B	Very Good
C0	C	Good
D0	D	Satisfactory
E0	E	Weak
F0	F	Poor
G0	G	Very Poor
H	H	

Some courses in the subjects of Education, Medicine, Dentistry, Nursing and Veterinary Medicine are assessed in terms of Professional Practice Competencies under Schedule B.

<sup>1</sup>[University Regulations, University Fees and General Information for Students, Section 16](#)

### Non Honours Final Results (including Masters Degrees, Postgraduate Diplomas and Certificates, and Ordinary Degrees)

QD	Qualified with Distinction (Postgraduate)	UD	Qualified with Distinction (Undergraduate)
QM	Qualified with Merit (Postgraduate)	UM	Qualified with Merit (Undergraduate)
Q	Qualified (Postgraduate)	UQ	Qualified (Undergraduate)

### Honours Degree Final Results

1	First Class Honours	3	Third Class Honours
U	Upper Second Class Honours	4	Unclassified Honours
L	Lower Second Class Honours	8	No Award

### B.D.S.; B.V.M.S.; M.B.,Ch.B Finals Results

HH	Honours
CC	Commendation
QQ	Pass
P8	No Award

OTHER CODES	DESCRIPTION
MV	Approved compassionate or certified medical absence
7	Deferred result
AU	Audit only
FC	Foreign Credit* (students studying abroad for whom UofG equivalent result not available)
CA	Credit Awarded**
CR	Credit refused
CW	Credit withheld
DD	Distinction
CP	Complete
NC	Not Complete
P	Pass
NP	Not Pass
FN	Fail - no resit
FR	Fail - resit permitted
SAT	Satisfactory
UNS	Unsatisfactory

*\*All grades gained from courses studied overseas are converted into grades set out in the University's own assessment schedules: A and B. The courses, the credit awarded and the converted grades will be displayed in section 4d - Record of Learning and Achievement.*

*\*\*This grade indicates that the student took the course and credit was awarded. However, due to disruption to the assessment process for that course, no academic grade from the Code of Assessment is available.*

David Bennion  
Director of Registry

May 2023

The University of Glasgow, charity number SC004401

The University of Glasgow was founded in 1451 by Pope Nicholas V. It is Scotland's second oldest and the United Kingdom's fourth oldest university and one of the most prestigious, with an international reputation for its research and teaching. With over 21,000 students studying for first degrees and nearly 14,000 postgraduates in 2022-2023, Glasgow is also one of the largest universities in the UK.

The four Colleges of the University embrace the main academic disciplines in the 23 Schools. The Colleges are:

Arts  
Science & Engineering

Medical, Veterinary & Life Sciences  
Social Sciences

The University is autonomous and self-governing. Its power to confer its academic awards dates from the Papal Bull of 1451. Its modern constitutional framework derives from the Universities (Scotland) Acts 1858 - 1966. These Acts make provision for the main statutory bodies, including the Senate, which is the supreme academic body, with responsibility for academic standards, the Court, which is the overall governing body, and the General Council, which is formed by the graduates and other members of the University.

#### *First Degrees - Bologna First Cycle awards*

Most undergraduate students take Honours degrees after four years of study. Honours degrees are classified according to student performance: first (the highest), upper second, lower second, or third; exceptionally, they may be awarded as unclassified Honours degrees. Honours degrees in modern languages, which require students to spend a year abroad, take five years. In the tradition of the Scottish ancient universities, many first degrees in arts disciplines have the designation Master of Arts; other first degrees have the designation Bachelor. A number of students graduate after three years with a Designated or General degree. The BDS, BVMS and MB ChB are five-year, non-Honours degrees. Students undertaking the latter degrees may additionally study for an intercalated Bachelor's degree.

#### *Higher Degrees - Bologna Second Cycle awards*

Postgraduate students undertake a wide range of taught and research Master's degrees, which typically involve one or two years of study. Postgraduate Certificates and Diplomas are also available in a number of disciplines. The MDTechEd, MEd, MEng and MSci are degrees that take students to a postgraduate level of study in five years, without their having initially obtained a Bachelor's degree.

#### *Higher Degrees - Bologna Third Cycle awards*

Most doctoral students undertake the PhD. A number of doctorate awards in designated professional areas are also available. The University also awards higher doctorates in a range of disciplines.

The University of Glasgow additionally validates degrees for which students study at a number of associated or accredited institutions that do not have the power to award degrees in their own right. A number of degrees are also awarded jointly with other universities.

Detailed information on the requirements of each degree programme and a full list of degrees awarded are published each year in the University Regulations which is available at: <https://www.gla.ac.uk/myglasgow/apg/policies/uniregs/>. Assessment for each award is carried out in accordance with the University's Code of Assessment in force at the time and published in the relevant edition of the University Regulations. Further programme information is published in programme specifications which are currently available at: <https://www.gla.ac.uk/myglasgow/apg/programmesearch/>

Further information about the University of Glasgow is available at: <https://www.gla.ac.uk/>

The University of Glasgow, charity number SC004401



# Description of Higher Education in Scotland<sup>1</sup>

## Introduction

Scotland has a distinctive higher education system and also operates under a devolved government, which includes devolved responsibility for higher education. There is a separate Description of Higher Education in England, Wales and Northern Ireland where the system is different to that of Scotland.

Scotland's distinctive higher education system has 19 higher education institutions (HEIs). The 15 universities, the Open University in Scotland, a college of higher education, an art school, and a conservatoire all receive funding for research and for learning and teaching through the Scottish Funding Council (see <https://www.sfc.ac.uk>); funding is also received from other sources.

The HEIs are independent, self-governing bodies, active in teaching, research and scholarship. Where HEIs are degree awarding bodies they design the curriculum for the degrees they award, set the conditions on which they are awarded and the admissions arrangements. Degrees and other higher education qualifications are legally owned by the awarding institution, not by the state.

The HEIs offer qualifications at undergraduate (Bologna first cycle) and postgraduate (Bologna second and third cycle) levels. In Scotland, the law distinguishes the power to award degrees on the basis of completion of taught programmes (bachelors and most masters degrees) from the power to award Research (doctoral) Degrees. Most universities have powers to award taught and research Degrees. Some other HEIs have powers to award taught Degrees while others offer programmes leading to Degrees awarded by HEIs with Degree awarding powers.

Lists of institutions with powers to award degrees and institutions recognised by authorities in Scotland as being able to offer courses leading to a Degree of another HEI may be found at <https://www.universities-scotland.ac.uk>.

A small number of taught Degrees are available in tertiary colleges by the authority of a duly empowered HEI.

## Qualifications

The types of qualifications awarded at undergraduate (first cycle) and postgraduate level (second and third cycles) in Scotland are described in "The Framework for qualifications of higher education institutions in Scotland" which includes qualifications descriptors, developed with the university sector and published by the Quality Assurance Agency (QAA) (<https://www.qaa.ac.uk>). The Framework was self-certified as compatible with the Framework for Qualifications of the European Higher Education Area, the qualifications framework adopted as part of the Bologna Process, in October 2006. The Framework is also an integral part of a wider national framework: the Scottish Credit and Qualifications Framework (SCQF) that covers all forms of programmes and qualifications from school to doctorates (see Table 1 and <https://www.scof.org.uk>).

Institutions use SCQF levels and credit points for students entering or transferring between programmes or institutions, and use ECTS for transfers within the European area.

## Admission

Admissions requirements for particular programmes are set by the HEIs which offer a range of routes for entry and/or credit transfer into their programmes, and admit students whom they believe have the potential to complete their programmes successfully. The Open University is an open entry institution.

The most common qualification for entry to higher education is the Higher and, for a small number of high tariff courses, the Advanced Higher or, for entrants from the rest of the UK, the General Certificate of Education at "Advanced" level or

comparable qualifications. Pupils seeking to enter a HEI would normally take a number of Highers at an appropriate stage in the Senior Phase (4th, 5th and 6th year) of secondary school, according to the requirements of their own learning journey, or at a tertiary college. HEIs usually require 4-6 Highers for entry, but this may vary with subject. Highers are studied in considerable depth, involving coursework and final examinations. Advanced Highers have historically been taken by some pupils in S6 as a means of extending their specialisation, normally following successful completion of a Higher in that subject. They are also available in some tertiary colleges. Pupils may also take a Scottish Baccalaureate in Sciences, Languages, Expressive Arts, or Social Sciences and these consist of related Highers and Advanced Highers and an interdisciplinary project. Another major route into Degrees, often with full transfer of credit, is from Higher National Qualifications<sup>1</sup> offered in tertiary colleges.

## Quality Assurance

The academic standards of qualifications are secured and the quality of the student learning experience enhanced by the HEIs using a range of processes including extensive use of external examiners and suitably qualified independent external individuals. In some subject areas, Professional, Statutory and Regulatory Bodies (PSRBs) have a role to ensure that programmes meet the needs and standards of a particular profession; PSRBs do not set or regulate the academic standards of awards, which is the responsibility of the Degree awarding body.

HEIs in Scotland demonstrate their public accountability for quality and standards through a national Quality Enhancement Framework which assures academic standards and the quality of learning experiences. It has a strong focus on enhancement as follows:

HEIs take account of the UK Quality Code for Higher Education, which is published by the QAA. The Quality Code is a UK-wide code of practice for quality assurance and enhancement, which includes qualifications frameworks and UK subject level "benchmark statements" as well as extensive guidance on the quality of the student learning experience and provision of public information (see [www.qaa.ac.uk](http://www.qaa.ac.uk)). Higher Education providers use the Quality Code to design their respective policies for maintaining academic standards and to enhance quality. Reviewers use it as a key reference point for the external review and quality assurance of HEIs.

Subject level quality reviews are conducted by HEIs in accordance with guidance issued by the Scottish Funding Council (see <https://www.sfc.ac.uk>) and in light of the Quality Code.

External reviews of HEIs are conducted by the Quality Assurance Agency for Higher Education in Scotland (QAA Scotland). QAA Scotland is an independent body and charity established to provide public confidence in the quality and standards of higher education. The method of external review in Scotland involves teams of peer reviewers, including student and international reviewers. QAA Scotland publishes reports on the outcome of reviews and makes judgements about the effectiveness of the HEIs' arrangements for assuring academic standards and enhancing the quality of the learning experiences offered (see <https://www.qaa.ac.uk>). QAA Scotland also manages a programme of national Enhancement Themes (see <https://www.enhancementthemes.ac.uk/>).

A national development service supports students in their role as active participants in assuring standards and enhancing quality (see <https://www.sparqs.org.uk>).

<sup>1</sup>Awarded by the Scottish Qualifications Authority

TABLE 1

## The Scottish Credit and Qualifications Framework (SCQF)

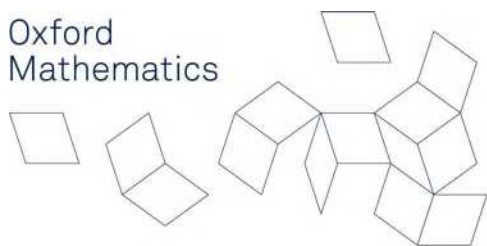
The SCQF covers all the major qualifications in Scotland from school to Doctorate and including work-based Scottish Vocational Qualifications (SVQs)

SCQF Level	Qualifications of Higher Education Institutions	SQA Higher National and National Units, Courses and Group Awards	SVQs
12	Doctoral Degrees (Minimum 540 SCQF credits)		Professional Apprenticeship
11	Masters Degrees (Minimum 180 SCQF credits) Integrated Masters Degrees (Minimum 600 SCQF Credits) Postgraduate Diploma (Minimum 120 SCQF credits) Postgraduate Certificate (Minimum 60 SCQF credits)		Professional Apprenticeship SVQ 5
10	Bachelors Degree with Honours (Minimum 480 SCQF credits) Graduate Diplomas and Certificates		Professional Apprenticeship
9	Bachelors Degree (Minimum 360 SCQF credits) Graduate Diplomas and Certificates	Professional Development Award	Technical Apprenticeship SVQ 4
8	Diploma of Higher Education (Minimum 240 SCQF credits)	Higher National Diploma	Technical Apprenticeship SVQ 4
7	Certificate of Higher Education (Minimum 120 SCQF credits)	Advanced Higher Scottish Baccalaureate Higher National Certificate	
6		Higher	Modern Apprenticeship SVQ 3
5		National 5 Intermediate 2	Modern Apprenticeship SVQ 2
4		National 4 Intermediate 1	SVQ 1
3		National 3 Access 3 National 2	
2		Access 2	
1		National 1 Access 1	

## Notes

- SCQF levels represent increasing complexity and demand in learning outcome.
- One credit represents the outcomes achievable by the average student though 10 notional hours of learner effort. In general terms, one full-time undergraduate year is considered to be 120 credits worth of learning. A postgraduate year is 180 credits. 1 ECTS credit is deemed equivalent to 2 SCQF credits. Research degrees - Master of Philosophy (MPhil) and Doctor of Philosophy (PhD) are not credit rated.
- Graduate Certificates (minimum of 60 SCQF credits) and Graduate Diplomas (minimum of 120 credits) are offered at levels 9 and 10 within the SCQF framework. They are offered for programmes that are for graduates but do not have outcomes that are at postgraduate level.
- The Bachelors Degree (level 9) leads to employment and in some instances can give access to postgraduate study particularly when accompanied by relevant work or professional experience.
- At postgraduate levels, the framework and the higher education qualifications are the same as those for the rest of the UK. The Honours Degree levels of the two frameworks are considered to be in broad alignment (the Honours Degree in Scotland normally takes four years and that in the rest of the UK takes three years). Below Honours level the frameworks reflect the different educational structures of Scotland and the rest of the UK.





11th December 2023

To Whom It May Concern

**Re: Allan Perez – MSc in Mathematical Sciences**

I am writing to confirm that Allan Perez is enrolled in the full time MSc in Mathematical Sciences running from 1<sup>st</sup> October 2023 to 30<sup>th</sup> June 2024 at the Mathematical Institute, University of Oxford. All assessment takes place at the end of the course and so no marks, and hence no official transcript, are available yet. Students are required to complete six lecture courses and a double unit dissertation in order to complete the MSc. There is also the possibility of taking one or two extra lecture courses. Students will make the final decision on which courses to be assessed on part way through the second term.

Further information about the student:

Teaching institution:	University of Oxford, Mathematical Institute
College:	Hertford College
Mode of attendance:	Full-time
Lecture courses (term 1):	Homological algebra Algebraic geometry Modular forms Differential geometry

Provisional lecture courses (term 2):

Dissertation topic:	Torsion of elliptic curves and abelian varieties
Dissertation supervisor:	Aleksander Horawa

Please do not hesitate to get in touch by emailing [kathryn.gillow@maths.ox.ac.uk](mailto:kathryn.gillow@maths.ox.ac.uk) if there is any further information I can provide.

Yours faithfully,

Dr Kathryn Gillow  
Course Director for the MSc in Mathematical Sciences

Efthymios Sofos,  
Department of Mathematics,  
Glasgow, Scotland.

December 5, 2023

Admissions Committee

Dear Sir or Madam,

This letter is about Allan Perez applying for your Ph.D. program. In the first semester of the academic year 2022-23, I taught him a course on Number Theory, specifically focusing on Analytic Number Theory. The course covered topics like Dirichlet series, averages of arithmetic functions, Riemann's work on the zeta function, and the proof of the prime number theorem based on Davenport's book "Multiplicative Number Theory" using complex analysis arguments.

It was an advanced course with around 30 students, and Allan stood out among the very best in the class. He consistently achieved the highest grades in weekly assignments and actively participated in tutorials, answering questions and solving challenging exercises. He always made questions after each lecture asking for references and more advanced results in current research literature related to the topic at hand.

Not only is Allan academically strong, but he is also friendly on a personal level. I believe he would make an excellent Ph.D. candidate, and I can't envision any issues with him working with a Ph.D. advisor. He seems to have a certain affinity for computers/programming/AI. He has a very rigorous background on programming as is made clear from his CV and I am sure this will be very useful if his Ph.D. project has a computational aspect.

Sincerely,

Efthymios Sofos



## Reference letter for Allan Perez

12 January 2024

Dear admissions committee,

I interacted with Allan quite closely when he was in his 3rd and 4th years of undergraduate at Glasgow. In Allan's 3rd year of undergraduate studies I was his Algebra lecturer. Since Allan asked many questions after lectures and made good use of the office hour, I got to know him during that time much better than I would get to know a typical student in a cohort of 70. Then Allan did a summer project under my supervision, during which we met roughly once a week over the course of 8 weeks, as I was guiding Allan's reading and exercise solving. In Allan's 4th year I was his Bachelor thesis advisor. In that capacity I was meeting him and two other students once a week for 10 weeks.

I would estimate that Allan was one of the top three students in my Algebra class in 3rd year, and in the top 15% of his year cohort in the 4th year.

In the 3rd year Algebra course Allan stayed after many (zoom) lectures, and also attended many office hours, mostly to ask questions that went beyond the curriculum, and which also often involved connections between algebra and other subjects he was learning.

Over the summer between years 3 and 4, Allan did a summer project with me over the course of 8 weeks. The goal had been to cover the equivalent of a first course on algebraic number theory, the theory of class groups of rings of integers of number fields, following Stewart and Tall. He conscientiously did almost all the exercises along the way. In the end Allan got through the first 4 chapters of the book, which was less than I had hoped for. I believe that this was due to two factors: firstly Allan continued working as a software developer part-time (despite having a scholarship for the duration of the summer); secondly he was doing additional reading in algebra and category theory in parallel.

Allan's 4th year project, which he did under my supervision, was on the theory of binary quadratic forms, with Cox's book "Primes of the form  $x^2 + ny^2$ " serving as the main reference. I started him off by having him learn the reduction theory of positive definite integral binary quadratic forms, but from there I left him a lot of freedom in picking his own direction. Allan decided that he wanted to learn the connection between binary quadratic forms and ideals of a quadratic number field, and presented in his essay Minkowski's proof of finiteness of class number for quadratic number fields. In comparison with other essays in his cohort Allan's write-up had a pretty good scope and was fairly well written.

After 4 years at Glasgow Allan secured a full scholarship for a Masters at Oxford, which he is pursuing now.

**Alex Bartel**  
Professor of Mathematics

School of Mathematics & Statistics, The University of Glasgow,  
Glasgow G12 8QQ, U.K. Tel: 0141 330 2940 Fax: 0141 330 4111  
alex.bartel@glasgow.ac.uk, <http://www.maths.gla.ac.uk/~abartel/>

Allan's main strength, and sometimes also weakness, is his immense mathematical curiosity. He often came to the project meetings with questions about topics like the Shimura–Taniyama conjecture, or dynamical systems, or connections with algebraic topology. Once he learns to channel and control this curiosity so that it does not lead to a superficial engagement with his main topics, which I am confident that he will learn, this will serve as an immense asset. I believe that Allan has a researcher's attitude, and that he is on track to becoming a strong mathematician. He is very ambitious, and I expect that he will flourish at a very good university.

Please do not hesitate to contact me with any questions you may have.

Sincerely,

A handwritten signature in black ink that reads "Alex Bartel". The script is fluid and cursive, with the first letters of "Alex" and "Bartel" being capitalized and prominent.

Alex Bartel

