DIVISION OF MATHEMATICAL AND PHYSICAL SCIENCES

MSc in Mathematics and the Foundations of Computer Science
Report of the Examiners (2014-15)

Part I
1. Results split by gender breakdown

	Total	Male	Female
Entries	27	15	12
Passes awarded	10	6	4
Distinctions Awarded	15	9	6
Failed TT hurdle	1	0	1
Failed	2	0	2

2. Vivas
Twenty seven candidates who submitted dissertations had vivas.

3. Number of scripts multiply marked
Each written assignment (mini-project) was marked by the lecturer for that course (who was therefore appointed as an assessor if they were not already an examiner) and was also marked by a second assessor and then moderated by the examiners.

Each dissertation was marked by the dissertation supervisor (who was therefore appointed as an assessor) and was also marked by a second assessor and then moderated by the examiners taking into consideration comments supplied both markers.

4. Distribution of topics
Of the 39 topics available, the numbers taken were as follows:

Michaelmas Term	Passed	Failed
Algebraic Topology	0	0
Analytic Number Theory	6	0
Analytic Topology	6	0
Introduction to Representation Theory	3	0
Lie Algebras	0	0
Model Theory	1	0
Modular Forms	1	0
Topology and Groups	2	0
Algebraic Geometry ®	5	0
Homological Algebra	1	0
Geometric Group Theory	0	0
Applied Probability	1	0
Categories Proofs & Processes	13	1
Communication Theory	6	0
Computer-Aided Formal Verification	3	0
Foundations of Computer Science	10	2
Quantum Computer Science	14	1
Automata, Logic and Games	4	0
Combinatorics	2	0
Computational Learning Theory	8	0

Hilary Term	Passed	Failed
Algebraic Number Theory	6	1
Commutative Algebra	3	0
Gödel's Incompleteness Theorems	0	0
Lambda Calculus and Types	3	0
Axiomatic Set Theory	0	0
Infinite Groups	2	0
Non-Commutative Rings	1	0
Concurrency	1	0
Graph Theory	11	0
Categorical Quantum Mechanics	3	0
Computational Algebraic Topology	6	0
Elliptic Curves	10	0
Machine Learning	5	0
Networks	5	1
Probabilistic Combinatorics	2	1
Theory of Data and Knowledge Bases	4	0
Distributional Models of Meaning * (reading course)	4	0

Trinity Term	Passed	Failed
Computational Number Theory	8	0
Finite Dimensional Normed Spaces	1	1

5. Assessors
There were 54 assessors appointed to help with the examination.

A. Changes in examination methods and procedures this academic year
None

B. Changes in examining methods and procedures envisaged
None

Part II
39 courses were offered. 5 courses failed to attract any students. The performance was of a high standard, with 26 mini-project scripts receiving marks of 90 and above, 39 receiving 80 and above, 32 receiving 70 and above, 28 receiving 60 and above, 21 receiving 50 and above, and 8 failures. The overall standard of dissertations was very high this year. 4 were awarded a grade of 90 and above, 7 at 80 and above, 8 at 70 and above, 7 at 60 and above, 0 at 50 and above, and 1 fail.

The dissertation topics, which all had some (theoretical or practical) computing aspect to them, were as follows:-

- The Erdos- Hajnal conjecture
- Detecting Contextuality: Sheaf Cohomology and All vs Nothing Arguments
- Categorical Models of Meaning: Accommodating for Lexical Ambiguity and Entailment
  Detecting Contextuality: Sheaf Cohomology and All vs Nothing Arguments
- Comparing Meaning in Language and Cognition: P-Hyponymy, Concept Combination, Asymmetric Similarity
- Conjugacy in polycyclic groups
- On the Actions of Affine Algebraic Groups
- A Topological Approach to Temporal Networks
- Analytic Zariski Geometries in Differentially Closed Fields
- Parikh Images and the Maslov Hierarchy

- Solutions to Systems of Multivariate p-adic Power Series
- The graph of vertex-colourings
- Non-repetitive Graph Colourings
- A Higher Categories Approach for Modeling Biological Processes
- Post-quantum elliptic curve cryptography
- Beyond Weighted Automata: The Complexity of Minimization and Equivalence
- Manipulation of popular scientific impact indices by merging articles
- Profunctor Semantics for Linear Logic
- Asymptotic Formulae for the Connectivity of Bridge-Addable Graphs"
- Residue Formulas in Enumerative Geometry
- Investigating into data-driven and model based verification in a Bayesian framework
- Geometric Applications of Persistent Homology
- Beyond the Lov´asz Local Lemma: The Resample Algorithm, Entropy Compression and the Lefthanded Lemma
- Optimal Commitments in Leadership Games: A Query Complexity Analysis
- Infinite Torsion Groups
- Studying Approximate Nash Equilibria For 2-Player Games Through Best Response Queries
- Modelling Online Social Networks in Cities
- Proving the weak BSD conjecture for elliptic curves in the Cremona Database

Each candidate showed a good knowledge of his or her chosen area in the oral examination.
As with last year, the dissertation supervisors attended the vivas and where they were unable to attend they appointed a representative.

6. Examination Recommendations

This year, due to the large number of students, the vivas were split between those with a maths focus (x16) and those with a computer science focus (x11) and ran parallel over two days with two examiners (internal/external) and the dissertation supervisor in attendance.

M Escardo
J Barrett
J Talbot
V Flynn (Chairman)

19/10/15