### **DIVISION OF MATHEMATICAL PHYSICAL AND LIFE SCIENCES**

# MSc in Mathematics and the Foundations of Computer Science Report of the Examiners (2020-21)

#### PART I

#### **A: Statistics**

### 1. Numbers and percentages in each category

Category	Percentage (%)					
	2020-21	2019-20	2018/19	2020-21	2019-20	2018/19
Distinction	15	13	14	65	93	52
Merit	3	0	9	13	0	33
Pass	3	1	4	13	7	15
Fail	2	0	0	9	0	0
Failed TT hurdle	0	0	0	0	0	0
Entries	23	14	27	100	100	100

Two students failed to complete and did not submit a dissertation for 2020-21.

### 2. Vivas

The 21 students who completed dissertations all had vivas with two examiners and their second assessor.

### 3. Number of scripts multiply marked

Each written assignment (mini project) was marked by the lecturer of that course (who was therefore appointed as an assessor if they were not already an examiner) and was also marked by a second assessor, except for where the assignment had an accompanying mark scheme, this was marked by the lecturer of that course, in accordance with the examination conventions. All of the marks were 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. These marks were then moderated by the examiners taking into consideration comments provided by both markers.

#### B: New examination methods and procedures this academic year

There were no need methods or procedures

## C: Changes in examining methods and procedures envisaged

No changes are envisaged

## **D: Examination Conventions**

The conventions are available on the course webpage <u>https://www.maths.ox.ac.uk/members/students/postgraduate-courses/msc-mfocs</u> and are circulated to students along with Notices to Candidates.

## PART II

## **A: General Comments**

48 courses were offered. 8 courses failed to attract any students. The overall performance was of a high standard with 26 mini-project scripts receiving marks of 90 and above, 32 receiving 80 and above, 40 receiving 70 and above, 18 receiving 60 and above, 5 receiving 50 and above, and 2 failures. The overall standard of dissertations was very high this year. 3 were awarded a grade of 90 and above, 10 at 80 and above, 6 at 70 to 80, 2 at 60 to 70. No students were awarded marks under 60. Two candidates failed to submit, therefore resulting in an overall fail.

## **Examination Recommendations**

None.

### **B: Breakdown of results by gender**

	Total	Male	Female	Non-Binary
Entries	23	19	4	0
Passes awarded	3	3	0	0
Merits awarded	3	3	0	0
Distinctions Awarded	15	12	3	0

## **C.** Distribution of topics

Of the 48 topics available, the numbers taken were as follows:

Michaelmas Term	Passed	Failed
Lie Algebras	-	-
Model Theory	3	0
Introduction to Representation Theory – student		
who took this course, suspended	-	-
Algebraic Topology	2	0
Analytic Number Theory	2	0
Analytic Topology	1	0
Topology and Groups	3	0
Differentiable Manifolds	1	0
Category Theory	3	0
Infinite Groups	3	0
Homological Algebra	1	0
Algebraic Geometry	-	-
Additive and Combinatorial Number Theory	1	0
Categories, Proofs, and Processes (CS)	4	0
Computer Aided Formal Verification (CS)	3	0
Foundations of Computer Science (CS)	5	0
Graph Theory	8	0
Introduction to Cryptology	2	0
Integer Programming	6	0
Quantum Processes and Computation (CS)	9	0
Automata, Logic, and Games (CS)	6	0
Combinatorics	8	0

20+2 not taken		
Hilary Term	Passed	Failed
Algebraic Number Theory	3	0
	1	0
Codel Incompleteness Theorems	1	0
Lambda Calculus and Types (CS)		0
	5	0
Avienatic Set Theory	-	-
Axiomatic Set meory	2	0
Geometric Group Theory	3	0
Introduction to schemes	-	-
Non Commutative Rings	-	-
Representation Theory of Semisimple Lie Algebra	-	-
	6	0
Information Theory	1	0
Introduction to Quantum Information	2	0
Analysing Logics using Tree Automata* (CS)	-	-
Categorical Quantum Mechanics (CS)	4	0
Computational Algebraic Topology	1	0
Computational Game Theory (CS)	6	0
Computational Learning Theory (CS)	2	1
Distributional Models of Meaning* (CS)	1	0
Elliptic Curves	2	0
Networks	7	0
Probabilistic Combinatorics	7	0
Probability and Computing (CS)	7	0
18 + 5 not taken		
Trinity Term	Passed	Failed
Topological Groups	1	0
Concurrency	0	1
Applied Category Theory*	-	-

2 + 1 not taken

# D: The dissertation topics were as follows:

Random temporal and edge-ordered graphs
Community detection in Multilayer Networks using Multiplex Markov Chains
On the Verge to Improve Technique of T-count Reduction via Spider Nest
Identities
The Echo Chamber Effect on Twitter in the COVID-19 Vaccine Debate
Colimit computations for diagrams of vector spaces
Single-peaked preferences: identifying axes from samples
Embedding Graphs in Banach Spaces
Transfinite game values in infinite games
Lascar Groups and the Fundamental Groups of a First-Order Theory
Computer Verification of Combinatorics Constructions and Theorems
Splitting Theory of Groups
Max-Cut: Local Search and Smoothed Analysis

Reconstruction problems in Combinatorics
The Arithmetic of Elliptic Curves and Jacobians of Genus 2 Curves
Feynman Diagrams in Categorical Quantum Mechanics
Synthesising Reward Automata for Reinforcement Learning Using Hidden Markov Models
Multi-Agent Reinforcement Learning with Temporal Logic Specifications under Uncertainty
Pre-processing in Inductive Logic Programming
Safety During Training in LTL-Guided Reinforcement Learning
Grammar as Circuits
Enriched Category Theory, Generalised Logic, and Homotopy Type Theory
Information Propagation in Deep Neural Networks with Drop-out
Notions of Agreement and Disagreement in Social Choice
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Each candidate showed a good knowledge of his or her chosen area in the oral examination. Instead of inviting the dissertation supervisors, the second assessors were invited to attend the vivas.

## **E. Mitigating Circumstances**

I. Candidate 1050443: This candidate submitted a mitigating circumstance stating that he intended to withdraw from the course, Categories, Proofs, and Processes. However, he was unable to get in touch with admin during the Christmas Break and decided to do the project only a few days before the deadline. Although the admin staff was able to process his withdrawal, the candidate still chose to submit, although he feels the product was rushed and suboptimal.

The candidate did very well in spite of the MC, the board decided to not amend the mark.

II. **Candidate 1006493:** This candidate submitted a mitigating circumstance stating that the pandemic affected their mental health. The inability to work in Oxford and interact with other students caused a feeling of isolation. This affected the student's motivation and energy levels while working on their projects.

The board decided to not take any action regarding this candidate's marks, but agreed to revisit this mitigating circumstance at the final exam board.

The candidate's final classification was a distinction, so the examiners agreed no further action need take place.

III. Candidate 1053596 submitted a mitigating circumstance stating that they have problems with their mental health. Stating mental health issues as the reason they missed some teaching and got started on the project too late and even with the extension they feel they didn't have sufficient time. The examiners agreed that this had a moderate to major impact and will consider this again once the candidate submits their dissertation.

The candidate didn't submit their dissertation or respond to their non-submission notification, thus resulting in an overall fail.

We had 8 dissertation extensions this year.

# F: Special Cases

There were no special cases to discuss.

## G: Names of members of the board of examiners

- A. Kissinger
- P. Papazoglou
- I. Potapov
- J. Wolf