

# Examiners' Report: Preliminary Examination in Mathematics and Philosophy 2013

## Part I

### A. STATISTICS

#### (1) Numbers and percentages in each class

See Table 1 and 2, page 1.

Table 1: Numbers in each class (Preliminary Examination)

	Number 2013	Percentages % 2013
Distinction	11	61.11
Pass	5	27.78
Partial Pass	2	11.11
Fail	0	0
Total	18	100

Table 2: Numbers in each class (Honour Moderations)

	Number				Percentages %			
	2012	2011	2010	2009	2012	2011	2010	2009
I	6	7	8	5	40	38.89	36.36	22.73
II	6	10	12	16	40	55.56	54.55	72.73
III	0	1	1	1	0	5.56	4.55	4.55
Fail	3	0	1	0	20	0	4.55	0
Total	15	18	22	22	100	100	100	100

#### (2) Vivas

No vivas were given.

### **(3) Marking of Scripts**

In Mathematics, all scripts were single marked according to a pre-agreed marking scheme which was strictly adhered to. There is an extensive checking process. In Philosophy, all scripts were single marked except for failing scripts, which were double-marked.

### **B. New examining methods and procedures**

The 2013 examinations changed from Honour Moderations to Preliminary Examination.

### **C. Changes in examining methods and procedures currently under discussion or contemplated for the future**

In the Moderators' view, it may be appropriate to introduce some rescaling of the marks for the Elements of Deductive Logic paper in future years. This is because the distribution of marks on this paper can be quite different from a typical essay-based exam. (Note that, this year, the average mark for EDL was 74.83, whereas for Introduction to Philosophy it was a more normal 66.06.) We encourage the Faculty of Philosophy to give this further consideration.

### **D. Notice of examination conventions for candidates**

The first Notice to Candidates was issued at the beginning of Trinity term.

These can be found at <https://www.maths.ox.ac.uk/notices/undergrad/2012-13/prelims>, and contain details of the examinations and assessments. The course Handbook contains the full examination conventions and all candidates are issued with this at Induction in their first year. All notices and examination conventions are on-line at <http://www.maths.ox.ac.uk/notices/undergrad>.

## Part II

### A. GENERAL COMMENTS ON THE EXAMINATION

#### Timetable

The examinations began on Monday 17th June at 2.30pm and ended on Thursday 20th June.

### B. EQUAL OPPORTUNITIES ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

The breakdown of the final classification by gender is as follows:-

Class	Num	Gender	Percent
Distinction	9	m	69.23
	2	f	40
Pass	3	m	23.08
	2	f	40
Partial Pass	1	m	7.69
	1	f	20
Fail	0	m	0
	0	f	0

### C. DETAILED NUMBERS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

#### Mathematics I

Question	Maths and Philosophy		Single School	
	Mean	Std Dev	Mean	Std Dev
Q1	11.22	4.98	12.75	4.70
Q2	10.33	3.50	9.29	4.60
Q3	11.79	3.07	12.78	3.73
Q4	13	3.16	12.45	4.87
Q5	17	4	12.97	5.24
Q6	14.75	4.39	13.7	3.71
Q7	16	5.64	17.10	3.75

Mathematics II

Question	Maths and Philosophy		Single School	
	Mean	Std Dev	Mean	Std Dev
Q1	12.89	1.88	12.38	2.92
Q2	12.76	3.17	13.26	3.90
Q3	8		13	8.49
Q4	7.3	4.85	8.18	4.84
Q5	13.21	6.04	15.03	4.40
Q6	11.15	2.27	11.13	4.08
Q7	9.11	5.48	8.1	5.32

Mathematics III(P)

Question	Maths and Philosophy		Single School	
	Mean	Std Dev	Mean	Std Dev
Q1	12.65	4.47	15.33	3.82
Q2	13	5.66	17.18	3.62
Q3	13.15	4.39	12.82	4.48
Q4	11.39	2.70	11.46	2.60
Q5	13.64	4.99	14.96	2.53
Q6	10.71	3.90	13.14	4.13

Paper 3: Elements of Deductive Logic

Maths and Philosophy	
AvgUSM	StdDevUSM
74.83	11.84

Paper 4: Introduction to Philosophy

AvgUSM	StdDevUSM
66.06	4.47

## D. COMMENTS ON INDIVIDUAL PAPERS

See the Mathematics report for reports on the following papers:

Mathematics I

Mathematics II

Mathematics III(P)

### **Report on Elements of Deductive Logic**

The examination consisted of 8 questions. A list of corrigenda for several of the questions was circulated with the paper. All but one of the 41 candidates passed, 26 of whom merited Distinctions (63%). The relatively high distribution of marks suggests that this paper was considerably less difficult than those set in past years; next year's candidates deserve to be told whether or not to expect a paper of comparable difficulty. In spite of the high marks achieved, there was still strong evidence that a large proportion of candidates for this paper have not mastered core areas of the Introduction to Logic course (as opposed to that which is proper to the Elements of Deductive Logic course).

Q. 1, (Expressive adequacy), 36 attempts: (a.i) Too many candidates failed to answer this question by an induction on complexity, instead relying on intuitive appeals to the recursive formation rules. (a.ii) Generally answered well, though some candidates persist in confusing the identity and logical equivalence of sentences. Answers to (b) were surprisingly (and worryingly) poor, with the majority of candidates giving either an incomplete or merely wrong definition of expressive adequacy. Answers to (c) often merely gestured to DeMorgan's Laws and the Disjunctive Normal Form theorems: candidates who offered proofs of these crucial lemmas were rewarded. Answers to (d) were generally better, though candidates who showed that a particular truth-function (e.g. negation) cannot be expressed had an easier time of it than those who showed that only positive truth-functions can be and that there are some non-positive truth-functions. (Indeed, some candidates forgot to prove the second part.) Answers to (e) were almost universally strong.

Q. 2, (Proof theory), 26 attempts: Most candidates failed to give satisfactory proofs of (a) either by making no reference to the inference rules of ND or else by providing malformed natural deductions. Some candidates answered (b) by appealing to the soundness, completeness, and compactness theorems; others merely noted that the result followed from the finitude of ND proofs. (It is perhaps worth noting that trying to prove this proposition by induction on the length of Delta begs the question, as it presupposes that every proof has finite length.) In parts (c) through (g), candidates generally performed well, typically losing marks for simple mistakes: for example, many candidates used a different

definition of deductive inconsistency to that supplied by the question and were penalized unless a proof of the equivalence of the two definitions was provided.

Q. 3, (Theories and deductive closure), 27 attempts: In (b), many candidates showed that all maximally consistent theories are complete, thereby assuming half of what they were asked to prove. Those candidates who did not use the results proved in (c) and (d) as lemmas found (e) difficult.

Q. 4, (Hintikka's lemma), 22 attempts: Unsurprisingly, nearly all of those candidates who attempted this question also attempted q. 3, but this was one of the more poorly answered questions. Those candidates who used definitions of consistency and completeness different to those supplied by the question were duly penalized. Several candidates misinterpreted (H3): the erroneous belief that every instance of the English word 'either' signals an exclusive disjunction is surprisingly wide-spread. In (b), many candidates assumed without justification that Delta was complete or else misread (ii) as 'If phi is not a member of Delta, then A assigns False to phi', which does not hold in general except on the assumption of Delta's completeness.

Q. 5, (Predicate formalization), 23 attempts: Answers to part (a) were (with notable exceptions) shockingly bad: most candidates showed no awareness of the standard formalizations of definite descriptions, instead making egregious errors of formalization such as interpreting the conclusion of the argument as equivalent to 'There is a person from Scotland in the room who is talking'. Neither (b) nor (c) proved difficult. Answers to (d) varied, but it was marked generously: the best scripts made reference to isomorphism.

Q. 6, (Numerically definite quantifiers), 20 attempts: Very few candidates had any trouble with (a) to (d). Answers to part (d) varied enormously, but the words 'in any way you like' permitted a great deal of latitude, and creative or unusual answers were rewarded rather than penalized.

Q. 7, (Natural deduction in predicate logic), 22 attempts: Given that all of this question covered material from the Introduction to Logic course, it was unsurprising (and a welcome contrast to q. 5) that almost every attempt managed to attract more than 80% of the marks.

Q. 8, (Variable clash), 7 attempts: By far the least popular question. About half of the scripts demonstrated how straight-forward the question was and earned very high marks, whereas the other half seemed motivated by desperation and barely managed passing marks. Having said that, only one candidate managed to successfully prove Russell's Paradox as presented in (a).

## **Report on Introduction to Philosophy**

### **General Philosophy Questions**

Q1a (Descartes) There was 1 attempt to answer this question. The answer received 64.

Q1b (Concept of knowledge and skepticism). There were 8 attempts to answer this question. The average was 65. There was a wide spread in marks ranging from 50 to 75. Weak answers simply did not properly appreciate the main features of the definitions of knowledge and the modern formulations of, and responses to, the problem of skepticism. Strong answers were able to articulate both, and in particular, to discuss, for example, issues such as epistemic closure, modal conditions for knowledge, and so on.

Q2a (Hume and induction) There was 1 attempt and this received a 65.

Q2b (Induction is part of definition of reasonable) There were 5 attempts to answer this, and the average was 63. Answers were generally ok, but not particularly strong.

Q3a (Cartesian dualism) There were 4 attempts and an average of 66. The spread was not wide (64–69).

Q3b (Physicalism) There were 5 attempts with an average of 68. The answers given were quite impressive, and this is a question where students with a specific interest in reductionism, mind and science could show a good understanding of these topics.

Q4a (Locke and personal identity) There were two attempts with an average of 68. Both were strong answers. Probably the small number of attempts with two high marks indicates that those who answered had studied the material carefully and were well-prepared.

Q4b (Teleportation and personal identity) There were four attempts with an average of 67. All four were strong high 2.i answers.

Q5a (Hume's account of free will) There were 5 attempts with an average of 66.

Q5b (Determinism and moral responsibility) There were 5 attempts with an average of 69. Three of these gave answers that received First marks.

Q6a (Hume and problem of evil) No one attempted this question.

Q6b (The Problem of evil in general) There were two attempts with an average of 66.

### **Frege Questions**

Q7 (Are numbers properties of things?) There were three attempts with an average of 70. It was clear that all three attempts understood Frege's arguments well, and were able to explain the points clearly and convincingly.

Q8 (Russells paradox and Freges logicism) There were 6 attempts with an average of 69. Overall, these were strong; the paradox was well-explained, and the formal issues understood and explained well. Three attempts received a First for their answer.

Q9 (Arithmetic truths analytic truths?) There were 8 attempts with an average of 63. There was a wide range of marks (50 72). In several cases, attempts didnt really grasp the concept of analytic truth. The strong answers, however, did and presented the quite complex arguments well and impressively.

Q10 (Can logic guarantee existence of objects?) No one attempted this question.

Q11 (Is mathematical induction analytic?) No one attempted this question.

Q12 (Julius Caesar problem) There were 9 attempts with an average of 64. Overall, the answers were in the mid 2.i area with one very weak answer (52) and one very strong (70).

Q13 (Extension of a concept is an object) There were 4 attempts with an average of 64. But the range was very high. Two marks were in 50s and one was 80. This is a difficult question, in fact. One needs to understand that the underlying paradox, associated with Basic Law V, derives ultimately from treating extensions as first-order things, and, because concepts apply to such first-order things, concepts can apply (indirectly) to themselves (i.e., to their own extensions). This self-reference is intimately connected to paradox.

Q14 (Possibility of a contradiction; justification of definitions) No one attempted this question.

## **E. RESERVED BUSINESS**

None.

## **F. NAMES OF MODERATORS**

- Prof Marc Lackenby (chair for Preliminary Examinations)
- Dr Richard Earl
- Dr Jeffrey Ketland
- Prof Simon Saunders