Examiners' Report: Preliminary Examination in Mathematics and Philosophy Trinity Term 2025

October 15, 2025

Part I

(1) Numbers and percentages in each class

See Table 1. Overall, 14 candidates were classified.

Table 1: Numbers in each class (Preliminary Examination)

	Numbers					Percentages %				
	2025	(2024)	(2023)	(2022)	(2021)	2025	(2024)	(2023)	(2022)	(2021)
Distinction	9	5	4	7	7	64.29	26.32	23.53	38.89	35
Pass	4	13	12	10	11	28.57	68.42	70.59	55.56	55
Partial Pass	1	1	1	0	2	7.14	5.26	5.88	0	10
Incomplete	0	0	1	0	0	0	0	0	5.56	0
Fail	0	0	0	0	0	0	0	0	0	0
Total	14	19	17	17	20	100	100	100	100	100

B. NEW EXAMINING METHODS AND PROCEDURES

None.

C. CHANGES IN EXAMINING METHODS AND PROCEDURES CURRENTLY UNDER DISCUSSION OR CONTEMPLATED FOR THE FUTURE

None.

D. NOTICE OF EXAMINATION CONVENTIONS FOR CANDIDATES

The Notice to Candidates, containing details of the examinations and assessments, was issued to all candidates at the beginning of Trinity term. The Examination Conventions in full were made available at https://www.maths.ox.ac.uk/members/students/undergraduate-courses/examinations-assessments/examination-conventions.

Part II

A. GENERAL COMMENTS ON THE EXAMINATION

Acknowledgements

First, the Moderators should like to thank the Undergraduate Studies Administration Team.

We should also like to thank Matthew Brechin and Waldemar Schlackow for maintaining and running the examination database and their assistance during the final examination board meeting.

We should like to thank the lecturers for their feedback on proposed exam questions; the assessors for their extraordinary assistance with marking; and the team of graduate checkers for their rapid work checking the marks on the papers.

Timetable

The examinations began on Monday 23rd June and ended on Friday 27th June.

Setting and checking of papers

The Moderators set and checked the questions, model solutions, and mark schemes. Every question was carefully considered by at least two moderators, and feedback was sought from lecturers. In a small number of cases feedback from lecturers was not available, and those were discussed in more detail until the Board of Moderators was satisfied that all questions were appropriate.

The questions were then combined into papers which were considered by the Board of Moderators and small changes were made to satisfy the Board that the papers were appropriate. After this a final proof-reading of the papers was completed before the Camera Ready Copies (CRCs) were produced. The whole Board of Moderators signed off the CRCs which were submitted to Examination Schools.

Marking and marks processing

The Moderators and Assessors marked the scripts according to the mark schemes and entered the marks. Small adjustments to some mark schemes were made at this stage, and care was take to ensure these were consistently applied to all candidates.

A team of graduate checkers, supervised by academic administration sorted all the scripts for each paper and carefully cross checked these against the mark scheme to spot any unmarked parts of questions, addition errors, or wrongly recorded marks. A number of errors were corrected, with each change checked and signed off by a Moderator, at least one of whom was present throughout the process.

Mitigating Circumstances

The Mitigating Circumstances Panel convened to band the impact level of the circumstances described in each Mitigating Circumstances Notices. Three bands labelled 1, 2, and 3 were used, with 1 being the least severe and 3 being the most severe.

Determination of University Standardised Marks

Marks for each individual assessment are reported as a University Standard Mark (USM) which is an integer between 0 and 100 inclusive. The Moderators used their academic judgment to map the raw marks on individual assessments to USMs using a process similar to previous years. In coming to this judgement the board followed the advice from the Mathematics Teaching Committee that the percentages awarded for each USM range of the examination should be in line with recent years. This alignment can be seen in Table 1; in more detail, for Papers I–III(P), a piecewise linear map was constructed as follows:

1. Candidates' raw marks for a given paper were ranked in descending order.
2. The default percentages p_1 of Distinctions and p_2 of Nominal Upper Seconds were selected.
3. The candidate at the p_1 percentile from the top of the ranked list was identified and assigned a USM of 70, and the corresponding raw mark denoted R_1.
4. The candidate at the $(p_1 + p_2)$ percentile from the top of the list was assigned a USM of 60 and the corresponding raw mark denoted R_2.
5. The line segment between $(R_1, 70)$ and $(R_2, 60)$ was extended linearly to USMs of 72 and 57 respectively, and the corresponding raw marks denoted C_1 and C_2 respectively.
6. A line segment through $(C_2, 57)$ was extended towards the vertical axis, as if it were to join the axis at $(0, 10)$, but the line segment was

terminated at a USM of 37 and the raw mark at the termination point was denoted C_3.

With these data a piecewise linear map was constructed with vertices at $\{(0,0), (C_3, 37), (C_2, 57), (C_1, 72), (100, 100)\}$.

Reports from the Assessors describing the apparent relative difficulty and the general standard of solutions for each question were then considered, and the Board decided that the values of $p_1 = 31\%$ and $p_2 = 48\%$ were suitable for all papers.

The vertices of the final maps used in each assessment are listed in Table 2.

Table 2: Vertices of final piecewise linear model

Paper	Vertices				
I	0;0	22;37	35;57	66.4;72	100;100
II	0;0	28;37	49.4;57	82.4;72	100;100
III(P)	0;0	33.5;37	60.3;57	88.8;72	120;100

The overall outcome is calculated from the USMs for individual papers. Denote by:

$$M = \frac{5}{14}MI + \frac{5}{14}MII + \frac{4}{14}MIII(P)$$

P the average of the two Philosophy USMs and

A the average of M and P.

Each USM is symmetrically rounded. [62.49 will be rounded down and 62.5 would be rounded up]

Candidates shall be deemed to have passed the examination if they have satisfied the Moderators in all five papers.

The outcome of the Preliminary Examination will be awarded according to the following conventions:

Distinction: both $A \geq 67$ and either $M \geq 70$ and $P \geq 60$ or $P \geq 70$ and $M \geq 60$, and a mark of at least 40 on each paper;

Pass: not a Distinction and a USM of at least 40 on each paper;

Partial Pass: a Partial Pass is awarded to candidates who obtain a mark of less than 40 on one or two papers, or each of papers I, II III(P) and no other paper;

Fail: a candidate achieving a USM of less than 40 on three or more papers, unless the three papers are papers I, II, III(P).

The scripts of those candidates at the boundaries between outcome classes were scrutinised carefully to determine which attained the relevant qualitative descriptors and changes were made to move those into the correct class.

Mitigating Circumstances were then considered using the banding produced by the Mitigating Circumstances Panel, and appropriate actions were taken and recorded.

Table 3 gives the rank list ordered by the average of Av_1 and Av_2 (as defined above), showing the number and percentage of candidates with USM greater than or equal to each value.

Table 3: Rank list of average USM scores

		Candidates with USM $\geq x$	
USM (x)	Rank	Number	Percentage
86.25	1	1	7.14
83.43	2	2	14.29
73.36	3	3	21.43
73.18	4	4	28.57
70.61	5	5	35.71
69.5	6	6	42.86
67.86	7	7	50
67.79	8	8	57.14
66.5	9	9	64.29
65.97	10	10	71.43
60.18	11	11	78.57
58.5	12	12	85.71
55	13	13	92.86
52.07	14	14	100

B. EQUAL OPPORTUNITY ISSUES AND BREAKDOWN OF THE RESULTS BY GENDER

Table 4 shows the performances of candidates by gender. Here gender is the gender as recorded on eVision.

Table 4: Breakdown of results by gender

Outcome	Number											
	2025			2024			2023			2022		
	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total
Distinction	4	5	9	1	4	5	0	4	4	3	4	7
Pass	3	1	4	5	8	13	9	3	12	6	4	10
Partial Pass	1	0	1	1	0	1	0	0	0	1	0	0
Incomplete	0	0	0	0	0	0	0	0	0	0	0	0
Fail	0	0	0	0	0	0	0	0	0	0	0	0
Total	8	6	14	7	12	19	9	7	16	10	8	18

Outcome	Percentage											
	2025			2024			2023			2022		
	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total
Distinction	50	83.33	64.29	14.29	33.33	26.31	0	57.14	25	30	50	38.89
Pass	37.5	16.67	28.57	71.42	66.67	68.42	100	42.86	75	60	50	55.56
Partial Pass	12.5	0.00	7.14	14.28	0.00	5.26	0.00	0.00	0.00	10	0.00	5.56
Incomplete	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fail	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

C. STATISTICS ON CANDIDATES' PERFORMANCE IN EACH PART OF THE EXAMINATION

Table 5: Numbers taking each paper

Paper	Number of Candidates	Average raw mark	Std dev of raw marks	Average USM	Std dev of USMs
I	14	58.93	17.56	69.07	11.45
II	14	68.5	17.91	67.21	12.65
III(P)	14	47.07	13.25	65.86	12.97

Tables 6–8 give the performance statistics for each individual assessment, showing for each question the average mark, first over all attempts, and then over the attempts used; the standard deviation over all attempts; and finally the total number of attempts, first those that were used, and then those that were unused.

Table 6: Statistics for Paper I

Question	Average mark		Std	No. of Attempts	
Number	All	Used	dev	Used	Unused
Q1	12.64	12.64	4.47	14	0
Q2	15.29	15.29	4.14	14	0
Q3	9	9	5.48	10	0
Q4	11.25	11.25	3.3	4	0
Q5	9.92	9.92	3.09	12	0
Q6	12.1	12.1	4.51	10	0
Q7	11.8	11.8	5.02	5	0

Table 7: Statistics for Paper II

Question	Average mark		Std	No. of Attempts	
Number	All	Used	dev	Used	Unused
Q1	15.67	15.67	3.2	6	0
Q2	12.58	12.58	3.03	12	0
Q3	15.9	15.9	3.11	10	0
Q4	10.89	10.89	4.57	9	0
Q5	16.5	16.5	3.37	10	0
Q6	14.78	14.78	4.35	9	0
Q7	13.25	13.25	5.08	12	0

Table 8: Statistics for Paper III(P)

Question	Average mark		Std	No. of Attempts	
Number	All	Used	dev	Used	Unused
Q1	12.5	12.5	4.15	14	0
Q2	11	11		1	0
Q3	14.5	14.5	4.08	12	0
Q4	9.22	9.22	4.29	9	0
Q5	11	11	2.4	10	0
Q6	11.78	11.78	3.9	9	0

D. COMMENTS ON PAPERS AND ON INDIVIDUAL QUESTIONS

Please see separate Mathematics Report for Papers shared with Mathematics, and similarly for Philosophy Papers see Philosophy Report.

Introduction to Philosophy

The distribution of marks on this section was in line with previous years, with a mean mark in the mid-60s, and marks ranging from the high 40s to low 80s on individual questions. Below can be found commentary on individual questions.

1. Should the problem of philosophical scepticism have any impact on

our day-to-day lives? This was a popular question. Weak answers simply 'dumped' surveys of e.g. Nozick, with little sensitivity to the question. Better answers leveraged e.g. the upshot of the sensitivity analysis of knowledge to argue that everyday knowledge can be retained despite the problem of philosophical scepticism, and as such we shouldn't be troubled by the latter. The best answers discussed e.g. Quine on the naturalisation of epistemology.

Average mark for the question: 64

2. Let 'counter-induction' be the thesis that the future will not resemble the past. Assess this argument: "Counter-induction has never worked in the past. So, it will work in the future." This question was generally answered well; candidates discussed the differences between induction and counter-induction, issues of rule vs premise circularity, and probed whether there is any sense in which induction is better justified than counter-induction.

Average mark for question: 68

3. "Substance dualism fails, because it cannot explain how any particular mind comes to be paired with any particular body." Discuss. This was a fairly standard question, but there were many weak answers which 'dumped' problems for substance dualism, without sufficient focus on the pairing problem in particular (which was the focus of the question). Candidates would do well to remember that marks can't be awarded for general (but irrelevant) knowledge; essay answers must in fact answer the question.

Average mark for question: 62

4. For subject S to know a proposition P, must there be some causal connection between S and the truth of P? This was a popular question. Again, it was fairly standard; good answers discussed what exactly a 'causal connection' amounts to, and whether this is sufficient or necessary for a subject to know a proposition. In doing so, good answers also discussed apparent counterexamples to the causal connection claim, e.g. the possibility of knowledge of mathematics, etc.

Average mark for question: 64

5. Can perception provide knowledge of the external world if I can't be certain that my perceptions are veridical? This question was answered quite reasonably; almost all candidates answered that certainty about the veridicality of one's perceptions isn't necessary for knowledge by perception; better answers used particular analyses of knowledge to undergird this (e.g., externalist analyses of knowledge).

Average mark for question: 66

6. Is being the same person over time simply a matter of being the same animal over time? This question was generally answered badly. There was (as

with question (3)) insufficient focus on the question as asked; rather, candidates 'dumped' tutorial content on the memory criterion for personal identity, etc. Candidates would have done better if their answered has tracked more closely and exclusively animalism about personal identity and its discontents.

Average mark for question: 61

7. Suppose that we inhabit a multiverse in which everything which can happen does happen. Are the prospects for a compelling notion of free will any better in such a scenario? There was quite a range of answers to this question. On the positive side, the slightly non-standard nature of this question provoked independence of thought, and several candidates wrote very good and clear answers on how the existence of a multiverse doesn't substantially help with the problem of free will. On the other hand, weaker answered appeared confused, meandering, and unclear. One general comment on this question is that almost all candidates could have been clear about what they actually take a 'multiverse' to be.

Average mark for question: 66

8. Is the existence of evil caused by humans compatible with the existence of God? This question was generally answered well: candidates homed in on the logical problem of evil, and the best discussed Plantinga on transworld depravity etc. with an impressive level of sophistication.

Average mark for question: 67

Answers to this section were generally good, showing for the most part a competent understanding of the relevant material. Below can be found commentary on individual questions.

9. In light of Frege's criticisms of Mill, is it possible to still maintain that arithmetical propositions are synthetic and a posteriori?

This question was answered well; candidates were able to articulate Frege's criticisms of Mill, and identify which are most effective. Good answers were also able to articulate how something like an updated Millian view can be developed which is immune from Frege's criticisms.

Average mark for question: 68

10. "Frege's logicist reduction of arithmetic stands or falls with Hume's Principle." Discuss.

This was not a popular question, but it was generally answered excellently, with clear and rigorous discussion of Hume's principle, its role in the Frege's reasoning, and the status of this principle.

Average mark for question: 74

11. Can numbers be subjective?

Only one candidate answered this question, but it was a good answer discussing Frege's arguments that numbers cannot be subjective. More independent analysis would have allowed that candidate to attain higher marks.

Average mark for question: omitted for small sample size

12. What is the philosophical significance of the Julius Caesar problem?

This was again a well-answered question, discussing the upshots of the Julius Caesar problem both for Frege' philosophy and more generally.

Average mark for question: 70

13. In what sense was Frege a Platonist about numbers? Is this version of Platonism compelling?

Answers to this question were generally clear and competent on Frege's Platonism. The better answers probed the peculiar and non-standard aspects of this Platonism, and whether there are any contradictions therein.

Average mark for question: 67

14. Outline Frege's account of Zahlangaben (statements of number), as presented in the Foundations of Arithmetic. What, in your view, are the most serious problems with this account, and can those problems be overcome?

Answers to this question tended to be a little less well-controlled than those for the other questions on this part of the paper; as such, the average mark was correspondingly lower.

Average mark for question: 63

Philosophical Topics in Logic and Probability

There were 42 entries for this paper: 11 Computer Science and Philosophy candidates, 14 Mathematics and Philosophy ones, and 17 Physics and Philosophy ones. No students failed. Overall, the standard was high. All candidates answered two questions from the Introduction to Logic section. There was an unfortunate typo in part (f) of Question 1, and two other minor typos that were relatively insignificant. Although the examiner was present in the exam room on the day, they were not able to correct the typo and notify students, as this is no longer allowed. 1(f) was therefore marked extremely generously.

The averages per school per question on the PTLP paper were as tabulated below. The average overall mark on the paper for all three schools combined was 67.05.

Table 9: Averages per school per question

Section	Question	No. of takers	CS and P	M and P	P and P	Combined Average
A	Q1	28	19	18.22	20.31	19.36
A	Q2	34	15.1	17.5	15.25	16.1
A	Q3	22	19.5	17.86	15.33	17.3
B	Q4	15	20.5	16.17	13.13	15.53
B	Q5	9	20	17.5	18.7	18.22
B	Q6	4	15	13	1	10.5
C	Q7	28	16.8	19.89	10.78	15.86
C	Q8	23	16.87	18.57	15.56	16.91
C	Q9	5	N/A	15	15	15

Introduction to Logic – Question 1

This question was very well done, especially given the very high marks awarded for part (f).

Introduction to Logic – Question 2

Generally well answered. Many candidates seemed unwilling to go into detail in (a) and in their answers to (c) seemed unaware of the problems caused by plurals and propositional quantification.

Introduction to Logic – Question 3

Generally well answered. Many students didn't seem to appreciate that, unlike quotation marks, there is no distinction between a left and a right asterisk. In part (b), aesthetic considerations were not what examiners were looking for.

Philosophical Topics in Logic – Question 4

Generally well answered, with (c)(ii) giving candidates the most trouble. Some candidates confused the quantifier in (d) with 'there exist at least two'.

Philosophical Topics in Logic – Question 5

Generally well answered. Marks were deducted for not paying close attention to Skolem's text, as the question requested.

Philosophical Topics in Logic – Question 6

A very difficult question with few takers. The exam setters felt it was reasonable to set one hard question given that the others were generally easy, but this was arguably too hard a question.

Philosophical Topics in Probability Theory – Question 7

Philosophical Topics in Probability Theory – Question 8

A gift of a question that was well answered. Candidates tended to focus on the binary case in (c) even though the question explicitly asked for the more general finite case.

Philosophical Topics in Probability Theory – Question 9

A relatively straightforward question with few takers.

Mathematics III(P)

Question 1. Many candidates attempted Question 1, but a significant proportion did not complete it. The parts that were attempted were generally done well. Most of the mistakes were minor computational errors in the first and second subquestions. Several students performed extremely well on this question, with some achieving full marks.

Question 2. Nearly all candidates were able to correctly complete part (a). In part (b), curves (i) and (ii) were usually handled correctly in parabolic coordinates, though curve (iii) proved more challenging, often due to algebraic difficulties. The final part of the question caused some confusion: many candidates did not realise it was asking for the area enclosed by all three curves, and instead attempted to compute areas related to each curve individually. This approach often led to results that didn't align with the intent of the question.

Question 3. Candidates had few problems on their bookwork; nearly all who attempted to solve part (a) could identify critical points by the simultaneous vanishing of partial derivatives and that they could characterize each critical point by inspecting the Hessian. The most common issues arose from numerical errors and failing to include the maximal value of the function.

Most candidates were able to successfully set up the optimization problem for part (b) via Lagrange multipliers and recognize the role of the Lagrange multiplier in implementing the constraint $x^2 + y^2 + z^2 = a^2$. Aside from numerical errors, a large fraction of candidates implicitly assumed the non-vanishing of one or more coordinate functions and then proceeded to solve the critical point equations, thereby missing the critical points for vanishing Lagrange multiplier $\lambda = 0$ which lie at the poles $x = y = 0$. With that in mind, candidates were largely successful in solving for the critical points with non-vanishing Lagrange multiplier $\lambda \neq 0$ but many included solutions with imaginary values of x, y, i.e. when $z > 0$. As with part (a), numerous candidates stopped at the identification of the critical points and failed to include the critical values of the function.

Question 4. While this question was chosen by a substantial number of students, overall, students found this question harder than anticipated leading to a very wide spread of marks including a small number of (almost) perfect scores, but also many single-digit scores. It looked like some spent too long writing out detailed justifications in (a) leaving too little time for (b).

While most students scored the two marks in (a)(i), a significant number of students missed the fact that changing the order of pairs or the order of colleges within pairs does not change the pairing in (a)(ii) and some lost further marks in the later parts of (a)(ii). Also a significant number of students did not spot the connection of (a)(iii) to counting the number of ways of choosing n colleges among the given $2n$ colleges, the RHS effectively counting those with j Oxford and $n-j$ Cambridge colleges, then summing over j. A handful of students correctly used the Binomial Theorem to evaluate the coefficient of x^n in $(1+x)^{2n} = (1+x)^n(1+x)^n$ and also scored full marks. Those who attempted an inductive proof wasted time.

In (b)(i), a variety of mistakes led to lost marks: the winner has to win $k+1$ matches, for the best college independently, each with probability p; for the randomly chosen college, explicit calculations did not succeed, but a number of candidates either spotted the symmetry or argued that the uniform pick in particular picks the winning college with probability $1/2n$ (regardless of which it is!), others introduced notation for probability that the ith college wins and nicely used this in an application of LTP. In (b)(ii) many scored some marks for the definition of expectation and the identification of some or all of the relevant probability mass function, or indeed for correct manipulations of geometric sums (and their derivatives), but few put this together correctly to find the expected number of matches of the best college. Some scored the further two marks for the random college by working out the average number of matches per college!

Question 5. This was the most popular question, but the spread of marks was rather wide again particularly towards the bottom. A significant number of students gave an incomplete statement of the LTP in (a). (b) was mostly done well, with some mistakes in the variance calculation and missing justification in (ii). In (c) many students did not justify their answer, and some seemed unsure about the concept of order in (i), but (ii) was often done well up to the point where repeated roots (notably 1) were to be discussed. In (iii), many had the right idea but struggled with the argument. (d) was done by a good number of students, but some left this blank or were unsure what quantity satisfies the recurrence relation.

Question 6. This question was also chosen by a substantial number of students and obtained a good spread of marks with quite a few perfect or near-perfect answers. Some students lost a mark or two failing to state the assumptions of the Weak Law of Large Numbers or getting the statement muddled. (b) was done well by the vast majority of students, and (c) was mostly done well, too – those who failed to acknowledge independence where needed lost a mark. The spread of marks arose from (d) and (e) mainly. Some candidates completed one, some the other, and there were often some marks lost, in (d) for not checking the assumptions of the WLLN carefully or for applying it with $\varepsilon = 0$, which is false, in (e) candidates often got stuck calculating the probability depending on U_1 and U_2, where an argument referring to the clearly specified area of a region in $[0, 1]^2$ was the most convincing, but full marks were available for all those who wrote the correct double integral. Partial answers also received partial credit.

E. COMMENTS ON PERFORMANCE OF IDENTIFIABLE INDIVIDUALS

Prizes

The Departmental Prize was split between the two top candidates:

Benjamin Black, Pembroke College.
Eveline Ong, Merton College.

F. MODERATORS AND ASSESSORS

Moderators: Prof. Paul Balister (Chair), Prof. Andras Juhasz, Prof. James Read, Prof. Alexander Paseau.

Assessors: Dr. Giovanni Italiano, Dr. William Hide, Dr. Samuel Lewis, Prof. Nikolay Nikolov, Dr. Fedor Pavutnitskiy, Dr. Antonio Girao, Prof. Matthias Winkel, Dr. Romain Ruzziconi, Dr. Akshay Srikant, Dr. Niklas Garner