Part B Structured Projects and Extended Essays Guidance Notes

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Contents

1 Introduction **3**

1.1 Why choose to offer a project? 4

2 BSP Structured Projects **5**

2.1 The amount of work involved 5

2.2 Timeline for BSP 5

2.3 Pre-approved topics 7

2.4 Student-Led project 7

2.5 Format of the project 8

2.6 Supervision 9

2.7 Peer review 9

2.8 Oral presentation 9

3 BOE Extended Essay **11**

3.1 The amount of work involved 11

3.2 Timeline for BOE 11

3.3 How to choose an extended essay topic 12

3.4 Finding a Supervisor 12

3.5 Applying to offer an extended essay 13

3.6 The project proposal 13

3.7 Supervision 16

3.8 Format of the essay 16
3.9 Oral presentations 17

4 Writing mathematics **18**

5 Referencing, plagiarism and AI **18**

6 Tips for writing a successful project **19**

7 Submitting your project **19**
7.1 Late submission 19

8 Marking of projects **20**
8.1 BSP Structured Projects 20
8.2 BOE Extended Essay 21

9 Problems and complaints **25**

References **26**

1 Introduction

The Projects Committee for the Final Honour School of Mathematics offers the following notes as guidance to tutors and undergraduates. It should be observed in particular that these notes relate to Mathematics structured projects and extended essays only. In the case of those doing one of the joint schools options the notes may provide helpful advice, but they are not intended to be definitive.

The projects offered at Part B are:

- an H-level double unit **Structured Project** in Mathematics or its applications (option **BSP**) in Part B;
- an H-level 7500-word double unit **Extended Essay** in a topic closely related to Mathematics ('Other Mathematical' option **BOE**);

The BSP project must have substantial mathematical content. The BOE project, in contrast, is intended to emphasise non-mathematical elements such as a historical, philosophical, musical or scientific theme, while still maintaining clear links to mathematics. You may offer either BSP or BOE, but not both.

Note these Key Points:

- a project will not be accepted for examination unless the project has been approved in advance by the Projects Committee of the Department of the Mathematical Institute.
- there are two types of Structured Project:
  - Pre-approved topics offered by supervisors;
  - Custom student-led projects.
- students wishing to offer a Part B BOE essay or a student-led Structured Project should submit an application for prior approval of a project no later than noon on Friday of Week 0 of Michaelmas Full Term (but may be submitted at any time from the beginning of the pre-ceding Trinity Term). The application form is available at https://www.maths.ox.ac.uk/members/students/undergraduate-courses/ teaching-and-learning/projects/essays;
  - applications must contain the **title** and a brief but clear description of the project;
  - the description of the project should be such as to convince the Projects Committee that it is appropriate to be offered as an H-level extended essay.

The Projects Committee may, where appropriate, reassign a project between the student-led BSP stream and the BOE stream if this provides a better fit with the proposed project's content.

1.1 Why choose to offer a project?

There are two main reasons why project options are offered by the Mathematical Institute. The first is educational. Most mathematics graduates have to write reports of one kind or another. The necessary skills—of collecting material, organising it, expounding it clearly and persuasively—are better learned sooner than later. The second is also educational. The department recognises that some students might prefer to show their mathematical understanding and progress via a sustained piece of exposition rather than in a timed examination.

2 BSP Structured Projects

This double credit option is designed to help you understand applications of mathematics to current research problems, and to learn some of the necessary techniques. We hope that it will help you to develop skills that will be useful to any future career: understanding new problems; working with new people; carrying out numerical computations; making oral presentations; independent study and time management.

2.1 The amount of work involved

You will be expected to:

- Learn about a current research problem from relevant research papers;
- Carry out the required calculations using MATLAB or other suitable software;
- Write up the problem and your findings;
- Give an oral presentation to a non-specialist audience;
- Undertake peer review.

2.2 Timeline for BSP

Application Process

Pre-Approved Projects

Trinity Term

Week 4, Options Fair	Lecture on Part B/C project options

Long Vacation

June-July	Provisional course registration form circulated. Students wanting to do BSP must state their preference.
July-August	Students contacted with project details and allocation.

Student-Led Project

Trinity Term

Week 4, Options Fair	Lecture on Part B/C project options

Long Vacation

June-July	Provisional course registration form circulated. Students wanting to do BSP must state their preference.
15th September	Suggested deadline for making initial contact with your proposed supervisor.

Michaelmas Term

Friday Week 0, 12noon	Deadline for submitting an application to offer an extended essay
Week 1	Projects Committee meet to consider applications
Week 2	Students informed of the outcome of their application
Friday (Week 3), 12noon	Deadline for students asked to revise their proposal to re-submit

Completing the Project
Michaelmas Term

Weeks 1-3	Initial group meeting with course organiser, Dr Cath Wilkins
Weeks 6-8	Meeting with course organiser, and individual meeting with specialist supervisor

Hilary Term

Week 1	Lecture on key skills, dissertation writing and the structure of the term
Weeks 1, 3, 5, 7	Individual meetings with specialist supervisors
Weeks 7-8	Help with presentations, including a mock presentation
Tuesday, Week 10	Submission of written report.
Easter Vacation	Peer review

Trinity Term

Week 1	Oral presentations

2.3 Pre-approved topics

In past years projects have included applications to numerical analysis, biology, finance and earth sciences, from 2024-25 the list of topics was extended to include pure options including but not limited to:

- Fractal Sets and Measures
- Gaussian Fields
- Numerical Linear Algebra
- Thermohaline Circulation

2.4 Student-Led project

Finding a Supervisor
Any faculty or post-doctoral member of the Mathematical Institute can be considered as a possible supervisor. If it is proposed that any other person outside the Mathematical Institute should supervise, then prior approval should be obtained from the chair of the Projects Committee. Students should think about their topic prior to contacting potential supervisors and should ideally contact members of faculty well ahead of the application dead-line.

Applying to offer a student-led structured project
In practice, a project proposal will be a negotiation between the student and the supervisor and therefore shaped by what the student wants to explore and what is reasonable in scope.
Once you have found a supervisor, you should prepare an abstract for your project with the support of your supervisor. This should be submitted alongside the project application form to the Projects Commit-tee via academic.administration@maths.ox.ac.uk. Your application must be received before 12noon on Friday of Week 0 Michaelmas Term. The application form is available at https://www.maths.ox.ac.uk/members/ students/undergraduate-courses/teaching-and-learning/projects/essays.

The Committee gives its approval if it considers that the project is appropriate and viable and that suitable assessors are available. If the committee judges that the project is not on an appropriate subject it will request that you revise your proposal. Similarly, if the proposal does not provide enough information for an assessment to be made, you will be asked to submit a revised abstract.

The project proposal

The proposal should be at least 150 words, excluding references, and at most one A4 side. It must be typed, and should be sufficiently detailed for the members of the committee to judge whether the project is of appropriate depth and content and whether it will be possible to find a suitable assessor in the University. You should include details of the main references—books, papers, etc.—with full bibliographic details.

A frequent consideration at the annual meeting of the Projects Committee to assess applications is whether the project offers a prospect of an "original contribution to the literature". Few projects will produce original research, but there should be a flavour, topics, mindset or aim to the project that makes it distinct from anything in the literature. It should not be possible for a committee member to reference one or two chapters of a text or an article that essentially cover the same material as a proposal and in much the same style. However it would be reasonable to take material that only exists in sources, written in a technical and abstract style for professional mathematicians, and explain this material at a more undergraduate level, possibly illuminating the discussion by focusing on one or two examples. It would precisely be this exposition, and collation of the material from several sources, that made the piece original.

In deciding when to approve project proposals the committee will consider how closely the work will relate to existing courses available to the student in the Oxford Mathematics syllabus. Following the principle that a student may not gain credit twice for the same material, projects which relate too closely to courses the student has already taken, or is eligible to take in the future, will not be allowed. For this reason you must declare, on your project application, which courses you have previously taken.

2.5 Format of the project

The written report will count as 75% of the final mark. The project write-up should not be more than 35 pages, though 25 to 35 pages including figures, tables and references would be a typical length. This is nominally equivalent to an essay of not more than 7500 words. Essays must be word-processed and prepared using LaTeX, or some other dialect of TeX.

You may apply for an IT account to enable you to use the computers in the study room to work on your essay. The computer account application form is available online at: http://www.maths.ox.ac.uk/members/it/it-facilities-access.

The submitted essay should conform to the following points.

The essay must be word-processed and have a font size of 12pt, with

all margins of at least 2cm.

- The text may be single spaced.
- The essay should have a title page which includes the following:
  - the title of the essay,
  - the candidate's examination number, NOT the candidate's name or college
  - the title of the candidate's degree course,
  - the term and year of submission.

Candidates are not expected to produce original results but should demonstrate an understanding of the model and its possibilities. The mathematics in the projects will be marked to reflect the candidate's ability to construct a basic framework, to extend it in appropriate ways, to produce relevant results, and to analyse the findings. Marks will also be awarded for the presentation of the work.

2.6 Supervision

At the beginning of the course students will be given written instructions for their chosen project. In Michaelmas Term students will read around their chosen topic. In Hilary Term students will meet regularly with their specialist supervisors, receiving 5 hours of specialist supervision.

2.7 Peer review

Students will be expected to produce a well-argued assessment of another student's project. You will not be required to grade the work but to prepare a written review of no more than 1000 words addressing such questions as:

- Has the problem been handled in an appropriate way?
- Are the results relevant and well presented?
- Are explanations clear and the arguments convincing?

A 10% over margin for word count may be given for continuation of key points.

2.8 Oral presentation

Students will be expected to give a 20-minute presentation of their work to a non-specialist audience. Marks will be awarded for choice of material

appropriate to the audience, structure and style of the presentation, delivery and time-keeping, ability to engage with the audience and responses to questions. Each presentation will be marked against a detailed list of criteria.

3 BOE Extended Essay

3.1 The amount of work involved

A project is of double unit weight, and should therefore be equivalent to two sixteen-hour lecture courses. Accordingly you might think of the project as the equivalent of half a term's work. If some preparation has been done in the Summer Vacation, it should occupy approximately a quarter of your working time during Michaelmas Term, the Christmas Vacation and Hilary Term.

You will receive 6 hours of tutorials from your supervisor as you work on your project. You and your supervisor can agree how best to arrange those six hours.

There is always a risk that a project might not succeed, especially if the original plan had involved some original research. Although this is a rare occurrence, examiners are aware of the possibility. They accept that a well-written account of the work done, with an explanation of why the original aims were not met, can nevertheless be worthy of high credit.

3.2 Timeline for BOE

Application Process

Trinity Term

Week 4, Options Fair	Lecture on Part B/C project options

Long Vacation

June-July	Provisional course registration form circulated. Students wanting to do BOE must state their preference. Students are advised to start contacting prospective supervisors.

Michaelmas Term

15th September	Deadline for making initial contact with your proposed supervisor.
12noon Friday, week 0	Deadline for applying for approval of a BOE topic.
Week 2	Students applying for approval of an essay notified of outcome of application

Completing the Project

Hilary Term

Weeks 6-8	Suggested time for oral presentations to take place

Trinity Term

Tuesday, week 1	Submission deadline

3.3 How to choose an extended essay topic

Any subject related to mathematics is appropriate as long as it gives you an opportunity to present your own work. It is understood that only in exceptional cases will this include original research. Often it will be a matter of organising, presenting, or completing material distilled (and understood) from advanced textbooks, monographs or journals. There have in the past been projects on the philosophy of mathematics, the history of mathematics, algebra, number theory, geometry, topology, analysis, numerical analysis, mechanics, mathematical biology, finance, theoretical physics, mathematics and music, and other subjects in, or closely related to, mathematics.

Examples of past extended essays can be found in the projects archive: https://www.maths.ox.ac.uk/members/students/undergraduate-courses/ teaching-and-learning/projects/project-archive (please note you will need to be logged in to access this page). The Projects Committee can give advice as to whether a proposed topic is suitable to be considered as a BSP or BOE.

If you have ideas about a project you would like to do, you should first seek guidance on content and possible supervisors from your college tutors or from members of the Projects Committee who will also be happy to help focus a project and find a supervisor (see further below).

3.4 Finding a Supervisor

Any faculty or post-doctoral member of the Mathematical Institute can be considered as a possible supervisor. Members of Projects Committee are willing to try to help you find a supervisor. The present committee is:

- Prof. Eamonn Gaffney, Academic Lead for Parts B and C (Chair)
- Dr Cath Wilkins, BSP Course Organiser
- Prof. Andrea Mondino
- Dr David Allwright
- Prof. Vidit Nanda
- Prof. Panos Papazoglou
- Dr Christopher Hollings

- Dr Richard Earl
- Prof. Qian Wang

If it is proposed that any other person from outside the Mathematical Institute should supervise, then prior approval should be obtained from the chair of the Projects Committee.

You should make initial contact with your proposed supervisor by **15th September**; do not wait until the beginning of Michaelmas Term. You should be aware that your tutors and potential supervisors may be hard to contact during the long vacation, and so you are advised to sort out a supervisor at the end of the preceding Trinity Term.

3.5 Applying to offer an extended essay

Once you have found a supervisor, you should prepare an abstract for your project (your supervisor will assist you with this). The abstract together with the project application form need to be submitted to the Projects Committee via via academic.administration@maths.ox.ac.uk. Your application must be received before 12 noon on Friday of Week 0 of Michaelmas Full Term. The application form is available at https://www.maths.ox.ac.uk/members/students/undergraduate-courses/teaching-and-learning/projects/essays.

The Committee gives its approval if it considers that the project is appropriate and viable and that suitable assessors are available. If the committee judges that the project is not on an appropriate subject it will request that you revise your proposal. Similarly, if the proposal does not provide enough information for an assessment to be made, you will be asked to submit a revised abstract.

The committee will decide during the first week of Michaelmas term which proposals are acceptable. Where a proposal is deemed unacceptable, the student will be allowed to submit a version revised along the lines suggested by the committee. If the revised version is unsuccessful, no further resubmission will be allowed. The decisions of the committee will be communicated by email.

If, after your project has been approved, you wish to make minor changes to the title or description of your project, then you may apply to the Chair of the Projects Committee for the appropriate permission.

3.6 The project proposal

The proposal should be at least 150 words, excluding references, and at most one A4 side. It must be typed, and should be sufficiently detailed for the

members of the committee to judge whether the project is of appropriate depth and content and whether it will be possible to find a suitable assessor in the University. You should include details of the main references—books, papers, etc.—with full bibliographic details.

A frequent consideration at the annual meeting of the Projects Committee to assess applications is whether the project offers a prospect of an "original contribution to the literature". Few projects will produce original research, but there should be a flavour, topics, mindset or aim to the project that makes it distinct from anything in the literature. It should not be possible for a committee member to reference one or two chapters of a text or an article that essentially cover the same material as a proposal and in much the same style. However it would be reasonable to take material that only exists in sources, written in a technical and abstract style for professional mathematicians, and explain this material at a more undergraduate level, possibly illuminating the discussion by focusing on one or two examples. It would precisely be this exposition, and collation of the material from several sources, that made the piece original.

In deciding when to approve project proposals the committee will consider how closely the work will relate to existing courses available to the student in the Oxford Mathematics syllabus. Following the principle that a student may not gain credit twice for the same material, projects which relate too closely to courses the student has already taken, or is eligible to take in the future, will not be allowed. For this reason you must declare, on your project application, which courses you have previously taken.

To ensure that you have included all the information required by the examiners and the committee the appropriate sections of the form should be checked and signed. Here is an example proposal, with some comments:-

Approximation of Irrational numbers by Rationals
BOE Extended Essay
C.F. Gauss (Worcester)

If α is a real irrational number then one can prove that there are infinitely many rational numbers a/q such that

$$\left|\alpha - \frac{a}{q}\right| \leqslant \frac{3}{q^2}$$

A number of questions naturally arise. Can one replace the constant 3 by anything smaller? Can one replace q^2 by q^3? What happens for specific irrationals like $\sqrt{2}$ or π?

The essay will discuss such issues. It will give an exposition of the theorems of Liouville, Thue, and Apéry, and describe applications to transcendence problems and Diophantine equations. If time permits a complete proof of the finiteness of integer solutions of the Mordell equation $y^3 = x^2 + k$ will be given. The latter will use results form the section B 'Algebraic Number Theory course".

References

G.H. Hardy and E.M. Wright, An introduction to the theory of numbers, Sixth edition. (Oxford University Press, Oxford, 2008). [Chapter XI in particular]

L.J. Mordell, Diophantine equations, Pure and Applied Mathematics, Vol. 30 (Academic Press, London-New York 1969).

A. van der Poorten, A proof that Euler missed ... Apéry's proof of the irrationality of $\zeta(3)$, Math. Intelligencer 1 (1978/79), no. 4, 195–203.

Comments: This is neatly typed, in Latex in fact. However the proposal is rather short, at around 100 words rather than the expected 150. The first paragraph introduces the problem to be discussed, and the second paragraph says more of what the essay would include. There isn't much sense of why the problem is historically interesting or what the answers are to these further questions. The final sentence tries to set out the relationship to courses on the syllabus and this is useful. It would also have been useful to cite the references during the proposal.

Further details of the specific results of Liouville, Thue and Apéry would be helpful (again with references). Reference to specific theorems of Liouville etc. would allow the committee to pinpoint the level of difficulty for the project.

The three references are not presented in quite the correct style – the essay itself will have to do better! However they do contain the key information. Two of the sources cited are text books, but one is a (rather easy) research article.

The proposal however is weak in making clear its individuality. What is being discussed that isn't found in standard text books? It would be helpful to make clear the purpose of the cited research article. Some specific investigation relating to a specific irrational (as mentioned in the second paragraph) or some bringing up to date of where current knowledge stands, a review of recent papers or similar, would help extend the scope of the essay outside the canonical material of a standard text.

So the proposal is most of the way there to being adequate and agreeable, but most likely Projects Committee would in the first instance refer the

proposal back asking for some of the above points to be addressed, seeking more detail, and seeking a clear sense of the individual aims of the project. This would not involve much delay (a few days) and would be intended as constructive criticism, on the basis of which the student can start the project with clearer aims in mind.

3.7 Supervision

You will have six hours of supervision across Michaelmas and Hilary terms, and you will be able to decide with your supervisor how best to arrange the supervision meetings. At the meetings, you should expect to update your supervisor on the work you have done since the last meeting, and can highlight any difficulties you have encountered. Your supervisor will provide you with suggestions on how to overcome difficulties and may direct you to relevant literature. Your supervisor will read and comment on a draft of your extended essay but you should ensure that you give it to them in good time and not just prior to the submission deadline.

Supervisors are asked to keep a log of the amount and nature of project supervision that they give and this will be made available to the second assessor marking the essay. Your supervisor will be one of two assessors for the extended essay. Further information about the marking of essays can be found in section 8.

3.8 Format of the essay

The examiners give credit for qualities such as content, accuracy, organisation, clarity and style. The final essay should be no longer than 7,500 words, and this usually equates to 25–30 pages. The word count may exclude any table of contents, all mathematical equations and symbols, diagrams, tables, bibliography and the texts of computer programs. How-ever any preface, footnotes, and appendices must be included. Students will need to self-certify the word length of their essay, and must specify how the word-count was produced. Guidance on how to count words in a LaTeX document can be found on the Maths Institute website: https://www.maths.ox.ac.uk/members/it/faqs/latex/word-count.

Essays must be word-processed but the use of LaTeX is not obligatory. For BOE essays other appropriate packages may be used. The references section gives details of a standard text book for LaTeX (Lamport [6]), and an excellent online guide is The Not So Short Introduction to LaTeX2e [8].

You may apply for an IT account to enable you to use the computers in

the study room to work on your essay. The computer account application form is available online at: http://www.maths.ox.ac.uk/members/ it/it-facilities-access.

The submitted essay should conform to the following points.

- The essay must be word-processed and have a font size of 12pt.
- The text may be single spaced.
- the study room to work on your essay. The computer account application form is available online at: http://www.maths.ox.ac.uk/members/ it/it-facilities-access.The submitted essay should conform to the following points. The essay must be word-processed and have a font size of 12pt.The text may be single spaced.The essay should have a title page which includes the following:

  - the candidate's examination number, NOT the candidate's name or college
  - the title of the candidate's degree course,
  - the term and year of submission.

3.9 Oral presentations

Each student offering an essay is required to give an oral presentation to their supervisor and at least one other person with some knowledge of the field of the project. This presentation forms no part of the final assessment of the project. It is intended to give you an opportunity to practise your presentation skills and for your supervisor to test, through questioning, your understanding of the material included in the essay. It is recommended that this presentation be delivered near the end of Hilary Term and after a first draft has been completed

4 Writing mathematics

Students should put effort into presenting their work as clearly as possible. The paper by Ehrenberg [1] is only 4 pages long and contains good advice on technical writing. Strunk and White [11] is a guide to writing more generally. Katzoff [3] is an older report on technical writing.

Excellent brief advice on mathematical writing is to be found on the London Mathematical Society website [7]. The book by Higham [2] gives very good tips on writing mathematics. The book of Krantz [5] is also recommended, as is the older book by Steenrod, Halmos, Schiffer and Dieudonne [10]. Section 1 of Knuth, Larrabee and Roberts [4] is a mini-course on technical writing and there is plenty of good advice in the rest of the book too.

Students should remember to back up all the files relating to their work regularly. This includes not only the codes used to generate results but also the drafts of the essay. This will be done automatically for students who are working on the Mathematical Institute computer network.

The finished essay should be a clear and well-reasoned account of the project. It is not necessary to include everything that has been learnt, only what is relevant. There is no point in writing out in great detail things that are well known (references should be used) but the essay should be able to be read and understood as it stands.

5 Referencing, plagiarism and AI

It is most important that a project is your own work and thus all sources should be carefully referenced in order to avoid plagiarism. The University's policy on plagiarism is available online at http://www.ox.ac.uk/students/academic/guidance/skills/plagiarism.

The London Mathematical Society's advice to its authors [9] gives advice on how to reference the work of others and explains a common referencing system. The conventions for citing internet resources include stating the URL and date accessed.

The department's policy on the use of generative AI in summatively assessed work is available online at https://www.maths.ox.ac.uk/members/students/departmental-and-university-regulations.

6 Tips for writing a successful project

Responsibility for the essay lies with the student and you should take a proactive approach to completing your essay. Below are some tips on writing a successful essay.

- Manage your time wisely. You should have a clear plan for when and how you will work on your project across Michaelmas term, the Christmas vacation, and Hilary term. Avoid leaving writing up your essay to the last minute.
- Structure your essay write-up with the reader in mind. Ensure that it has a clear beginning, middle and end.
- Proof-read your essay before you submit it. Make sure you have de-fined all the notation and terms that you use.

7 Submitting your project

You should submit your project digitally via Inspera on the given deadline. You will be required to fill out a digital declaration of authorship as part of the process. You do not need to add a separate document to your project for this.

No work will be accepted if it has already been submitted, wholly or substantially, for a degree at the University of Oxford, or for a degree of any other institution. This will then (noting the student's consent on the declaration form) be submitted to the turnitin plagiarism system.

7.1 Late submission

It is vital that you submit your work by the given deadline as any late submission will be reported to the Proctors and a late submission penalty may be applied. The late submission penalty tariff is set out in the examination conventions available at https://courses.maths.ox.ac.uk/course/view.php?id=6513. Please contact your college, see the examination conventions and the Ox-ford Student website (http://www.ox.ac.uk/students/academic/exams/ submission) for advice on what to do if you are unable to submit your work on time due to medical emergency or other urgent cause.

8 Marking of projects

8.1 BSP Structured Projects

The projects are assessed in three parts:

- Written report (75% of the total, broken down into 50% of available marks for mathematics, 50% for presentation)
- Peer review (10% of total marks)
- Oral presentation (15% of total marks)

The marks assigned to the peer review aspect go to the reviewer, they will not affect the mark of the reviewee, whose work will have already been graded by the examiners in the usual way.

There will be two assessors for each component of the project. For the writ-ten report and the peer review, one of these assessors will be the supervisor for the project. The assessors will independently propose marks and follow reconciliation guidelines below to agree the final mark.

Reconciliation of marks for structured projects *Written report*

- The two assessors read the project; the assessors independently write reports and produce preliminary marks out of 100.
- If the reports are broadly in agreement, and two assessor marks differ by no more than 10 marks, the examiners can take this average as the provisional mark. In these circumstances the Examiners will normally inform the assessors that they intend to do this and give the assessors a chance to object.
- If (2) does not apply then the Examiners will ask the assessors to confer on the standard of the work, with a view to agreeing a mark.
- If the two assessors cannot agree under (3), the Examiners will appoint a third assessor to independently assess the project.

Peer review

- The two assessors will independently assess the peer review according to the peer review marking scheme and produce preliminary marks out of 50.

- The examiners will normally take the average of the two preliminary marks.

Presentation

- The two assessors will independently assess each presentation according to the marking scheme.
- Following the presentations the two assessors will hold a meeting to agree a mark for each of the candidates
- If the two assessors cannot agree a mark they will send a summary of their discussion to the Examiners who will have the power to arbitrate.

8.2 BOE Extended Essay

The essay will be read and double blind marked by your supervisor and another assessor. When writing your essay, you should be aware of how it will be assessed and marked. The most important point is that for mathematical topics the project should be in **mathematics**. Do not forfeit marks by making your project inadequately mathematical. In fact, marks are awarded in the following proportions:

Content 75%; Presentation 25%.

Here is a brief explanation of these terms, a detailed mark scheme is given below:

Mathematical Content: proofs and assertions should be correct, and the mathematics should be appropriate for the level of study. In applied topics, the derivation of the model should be properly justified.

Content: the examiners are looking for some of your own thoughts and contributions: you must do more than rehash text books and lecture notes; you should use original sources; you must not plagiarise.

Presentation: the mathematics must be clear and well laid out; the English should be clear and grammatically correct; sources should be properly acknowledged, references should be properly cited. Give some thought to notation, choice of typeface, and numbering of equations and sections. Do not fail to number the pages. Be sure to supply complete and accurate references for all the sources used in completing the project, and be sure to cite them properly in the text.

Marking criteria
75% Content

20% Difficulty

16-20 The conceptual demands of the material go well beyond that expected and the scope of the project's aims are ambitious. The project requires nuanced understanding in various contexts.

12-15 The conceptual demands of the material are largely as expected of a project and the scope of the project's aims range appropriately, requiring subtle appreciation of some topics.

9-11 The conceptual demands of the material are below that expected or the scope of the project's aims are limited and less than expected. The project requires relatively straightforward understanding of topics.

0-8 The conceptual level of the material is significantly below that expected and the scope of the project is narrow and unambitious.

20% Correctness

16-20 The factual content of the project is invariably correct – as relevant this entails accurate statements of theorems and veracity of mathematics, logical conclusions and argument drawn from references, awareness of historical detail and context, correct appreciation of current educational theory, handling of data, etc..

12-15 There are minor errors with the mathematical content – this may involve some minor slips with theorems and proofs, logical conclusions and argument drawn from references, historical detail or context, cur-rent educational theory, handling of data, etc..

9-11 There is a significant error involving omission, misunderstanding, in-valid logical argument, misappreciation of historical context or education theory, analysis of data etc..

0-8 There are repeated errors of some substance within the project.

10% Comprehensiveness

8-10 The coverage of the project's themes is comprehensive and in depth, beyond what would normally be expected.

6-7 The coverage of the project's themes is largely comprehensive with the main theorems, methods, examples, ideas, developments, historical figures, educational theory, etc. included as appropriate.

4-5 The coverage of the project's themes is somewhat lacking, with some standard/canonical ideas, points of view, themes, historical figures or examples omitted or tangentially addressed.

0-3 Significant themes or topics of interest within the scope of the project are omitted.

10% Coherence

8-10 Overall the project's content has a superb coherence, certainty of direction, with the aims of the project being clear, main results well addressed and the conclusions well presented.

6-7 Overall the project's content coheres well, with the scope and aims of the project being clearly addressed.

4-5 The direction of the project is occasionally unclear, with the presence of some results or examples sometimes at odds with other material.

0-3 The project lacks coherence overall, with a sketchiness to its larger conception.

15% Individuality

12-15 The project is highly novel is its conception, and something completely original to the literature. It would make good recommended reading for an undergraduate interested in the project's topics.

9-11 The project is individual in its conception, with a good range of references.

6-8 The project overall is somewhat unimaginative and derivative in its aims. The range of references is a little narrow.

0-5 The project overall is rather derivative in nature, showing little imagination.

25% Presentation

10% Narrative

8-10 The project is superbly readable with an inviting style and well motivated in its direction, populated with well chosen examples and/or historical context.

6-7 The project is easy to read with the different themes linking naturally.

4-5 Poorly motivated and somewhat jarring turns in the narrative occasionally appear.

0-3 The project makes for difficult reading, with an unclear direction and poorly motivated material.

15% Clarity

12-15 The clarity of explanation/argumentation is superb with ideas care-fully, roundly introduced. The effort made for the benefit of the reader is obvious. Language is well chosen and never verbose. References are particularly well chosen and carefully cited. Any mathematics/figures are clearly displayed.

9-11 The explanation is clear with any new ideas/themes/points of view carefully introduced. The language is unambiguous and transparent. Referencing is carefully done. Any mathematics/figures are clearly displayed.

6-8 The explanation/argumentation is occasionally opaque/ambiguous or involves omissions. References and/or referencing is somewhat minimal. Care is occasionally not taken displaying mathematics/figures.

0-5 The explanation is commonly vague and poorly referenced. References and/or referencing is poor.

Class descriptors

70–100 The candidate shows clear focus on the question, with precise and accurate details (mathematical and other), imaginative selection of examples and appropriate selection and quality (rather than quantity) of sources, and cogent argument, supported by evidence.

Within this band the following finer gradations may be helpful:

90–100 A polished work of high individuality, well researched and of potentially publishable quality (in a gazette of a professional society say).

80–89 Demonstrates strong individuality of content or insight. Would be an appropriate entry for a national or university prize.

70–79 Work of high or very high quality, but perhaps lacking the originality that would be expected of publishable work. Might be a good candidate, for example, for a college prize.

60–69 Work that addresses the given topic, with solid command of factual content, reasonable range of examples and sources, coherent argument and analysis, and correct referencing and bibliography.

(Essays at the lower end of this range may lack some of these qualities or show them only intermittently.)

50–59 Work with some use of facts, sources, and arguments, but marred by one of more of a failure to address the topic, serious or frequent errors

of fact, a high proportion of indiscriminate information, speculation or unsupported argument, and incomplete or inaccurate referencing.

40–49 The candidate shows some knowledge of the topic but the work is marred by several of the following:- high levels of error or irrelevance, muddled or superficial ideas, incoherent or non-existent argument, in-competent use of sources, or very poor writing style.

30–39 The work demonstrates a little knowledge of the topic but no coherent argument.

0–29 The work demonstrates almost no knowledge of the topic.

9 Problems and complaints

Students who experience any problems with their project at any point should ensure they discuss this with somebody as soon as possible. If they feel unable to approach their supervisor, they should contact their college tutor or one of the Academic Administration team in the first instance.

If a student wishes to make a formal communication to the examiners relating to their essay, then it must be stressed that in order to preserve the independence of the examiners, they are not allowed to make contact directly. Any communication must be via the Senior Tutor of their college, who will, if they deem the matter of importance, contact the Proctors. The Proctors in turn communicate with the Chair of Examiners. Students who have any queries about the examinations or anything related to the examinations, for example, illness, personal issues, should not hesitate to seek further advice from their college tutor or from one of the Academic Administration team.

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