

Project Guide

MA4K8: Maths in Action

2026/2027

General information

Register your theme choice by

Sunday, 1 November 2026

This guide contains details of the assessment of Maths-in-Action Projects, guidance on source material, guidance on giving a presentation, and guidance on writing a scholarly report. Consult the Maths-in-Action MOODLE page regularly for updates and module news.

Changes

These will be announced on MOODLE if found necessary later in the year!

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1 Registration and general information

1.1 General information

Maths-in-Action projects are individual projects centred around a theme. This guide contains details of the assessment of Maths-in-Action Projects, guidance on source material, guidance on giving a presentation, guidance on writing a scholarly report. Consult the Maths-in-Action Moodle page regularly for updates and module news: [MA4K8 Moodle Page](#)

1.2 Theme choice and registration

1.2.1 Theme choice

Read the project descriptions in the [Theme Guide](#). Spend some time on the internet investigating a number of themes. Do not just decide based on title, but really think about them to the point that you have some sense what you would do for the project.

1.2.2 Theme registration

Register your project theme on the [MA4K8 Moodle Page](#) by the deadline stated there.

Important

Each theme will be restricted to a limited number of takers. To have a higher probability to get the theme of your choice, register within week 1, the first week of term.

Theme registration opens on the first day of term via the *Theme Selection Portal* on the [MA4K8 Moodle Page](#). You should enter your top three preferences in order.

The module organisers will then assign students to themes based on these preferences. It may take up to a week for the theme to be confirmed, it will then be displayed on the Moodle page.

We anticipate that most of the students who give their preferences by the end of week 1 will be allocated their first choice.

If you wish to change theme, please contact the module leaders directly.

1.3 Support

The main support for the Maths-in-Action projects are:

- This Project Guide.
- The [Theme Guide](#) describing each approved theme, defining the brief and listing some source materials.

In addition to the above:

- The organisers hold two open meetings for all Maths-in-Action project students in Term 1. At the meeting in Week 1 the organisers will discuss project details, offer advice and answer any questions. The meeting in Week 10 is primarily devoted to discussing progress reports and draft posters, but it is also a further opportunity to ask questions. A further opportunity for feedback and questions is provided in Term 2.
- Maths-in-Action projects are not supervised the way R-projects are. The organisers do not generally meet with students to discuss technical details of the projects. However, on occasion the organiser can discuss projects and offer advice on an individual basis. Send an email to the module organisers to start the discussion or to arrange an appointment.

1.4 What to do next

- Become familiar with this Maths-in-Action Project Guide, especially note from the outset how the project will be assessed.
- Get fully briefed on the scope and source material of your chosen theme.
- Scour the library and the Web for relevant material.
- Start reading, taking notes and reflecting on the structure of your Presentation, Popular Article and Scholarly Report.
- Keep detailed records of your sources (bibliographical information and URLs) for later citation, especially in your Progress Report and final Scholarly Report.
- Follow the advice for making your Presentation contained in this Maths-in-Action Project Guide.
- Follow the guidelines for writing a Scholarly Report and Popular Article contained in this Maths-in-Action Project Guide.

2 Assessment

The Maths-in-Action Projects are assessed on:

- Scholarly Report (60%).
- Popular Article (20%).
- Poster and Presentation (15%).
- Progress Report (5%).

Important

Details of the format of the poster and presentation will be posted on the [MA4K8 Moodle Page](#) later in the academic year. They are planned to take place on (probably 3) Wednesday afternoons towards the end of Term 2.

2.1 How the written material will be judged

The written material consists of two parts: A **Scholarly Report** and a **Popular Article**.

Important

Make it absolutely clear throughout which is your own work and which is derived from other sources. Cite your sources frequently. See the Section [5.4.3](#) in this document on **PLAGIARISM**.

2.1.1 Scholarly Report

Information

It is expected that your report will include mathematics on the level comparable with 3rd and 4th year modules and it is expected that your report will have some original components. This may be a new model, a new algorithm, new computations, your own review of material etc. See below.

The following is useful guidance:

- Year 1 and 2 mathematics can be assumed, and in general, should not be explained in any detail. For example, for completeness you might want to state some definitions from Algebra II, but you should not normally include any elementary definitions (e.g. linear independence). Material in lecture notes from Years 1 and 2 should not be reproduced in your Scholarly Report except in so far as it helps your narrative. For example, it would be fine to include the solution of a linear system of ODEs if this is part of the story you are telling, but assume your reader knows what this means and does not need to see the steps involved.
- Your Scholarly Report should normally contain a minimum of about 30% Year 3+ (= Years 3, 4, or higher) level mathematics. For some topics, this percentage might naturally be a bit larger, but be careful that there is more to the Scholarly Report than just mathematical formulas. For other topics, this proportion might be difficult to achieve, but this is a useful target to aim for. It can be made up for, to some extent, by advanced material in other areas such as physics, computer science, biology, etc.
- Your Scholarly Report is expected to contain some original component. This does not normally mean original research, but originality in exposition or originality in examples and approach. Possibilities are discussed in the section **Assessment of Originality** below.

Of course, projects vary considerably and the above proportions are not a hard rule, but rather a guidance. However, if your Scholarly Report will vary significantly from these, e.g. have less than 30% Year 3+ mathematics, you should discuss this with the organisers.

Marks will be awarded in the following categories

- Content
- Exposition
- Scholarship
- Originality
- (Optional) Other qualities specific to the theme or treatment

Assessment of content

Credit will be given for the following:

- *The suitability of the material.* This includes both the mathematical and non-mathematical aspects. Essentially, does the material fully address the theme brief and not stray from it?
- *The difficulty of the material.* Please refer to the previous discussion concerning the expected level of mathematics. All other things being equal, more advanced material receives higher marks. However, be very careful since marks are also awarded for a coherent exposition (see below).
- *The accuracy of the material.* This includes both the correctness of the mathematics, supporting arguments, and proofs, and also the correctness of non-mathematical aspects (for example figures, tables and captions).

Assessment of exposition Your goal is to convey the powerful role of mathematics in contemporary life within a limited space. This calls for great expository skill and will be correspondingly rewarded. There are both local and global aspects to the exposition.

At the local level, credit is given for

- The economy and cogency of the narrative
- The conciseness of the prose
- Logical precision in the detail of mathematical arguments and proofs

At the global level, the coherence of the Scholarly Report as a whole is judged. Credit is given for

- Compelling narrative in your own words from Introduction to Conclusion
- Clear overall logical structure and orderly progression of the results
- Careful cross-referencing within the document
- Consistent notation throughout, including figures and tables

Assessment of scholarship

Here two aspects of your presentation will be evaluated:

Use of sources.

- The completeness, breadth and transparency of your sources (books, articles, URLs etc.)
- The provision of full bibliographic information following accepted conventions in your list of references
- Your citation of references throughout the body of your report and explanation of what part they played in your report (from verbatim quotation to general background information)

- Clear indications of which parts of your report are your own work.

Your care in writing. This includes such things as:

- spelling, grammar, and absence of typographical errors
- appropriate labelling of sections, equations, figures, tables, etc.
- the use of white space and figure placement

Assessment of originality A Maths-in-Action project is not expected to include original mathematical research. However, there are a number of ways in which your scholarly report can contain a useful original aspect. Ensure that any contribution of this form is highlighted. For instance:

- An experiment or computer simulation demonstrating concepts from the theme or showing an application
- A devised example that illustrates the meaning or significance of your material and the way it can be applied
- A new formulation of a known result (such as a weakening of its hypotheses or a strengthening of its conclusions)
- A new twist to an existing proof (shortening or improving it in some way)
- A new application of known results to mathematics or to a real-world situation
- An email exchange with a leading worker in the field
- A taped interview or video clip with the same
- An account of direct contact with a firm or institution that develops or uses the applied technology
- Creation of a web site to disseminate findings in a creative way

As with mathematical content, it is understood that projects vary considerably and that some themes offer more possibilities for originality than others. The most essential thing is that the Scholarly Report not be merely a regurgitation of material from some book chapters and web sites. You should be looking to distinguish your Scholarly Report from what already exists.

Assessment of qualities specific to the theme and treatment. This is a small optional extra source of credit that may be given for a significantly original aspect, in the exposition or otherwise, undreamed of by the course organisers.

2.1.2 Popular Article

Marks will be awarded in the following categories

- Narrative
- Visual appeal
- Originality

Popular Articles vary considerably in style and approach, but normally they focus on one particular aspect within the project theme. There is ample scope for originality in the Popular Article. The following points are essential for obtaining good marks:

- The narrative should be lively and captivating
- The layout and graphics should be appealing and contribute to impact and to the message you are communicating
- It is normally expected that the Popular Article will contain from 1 to 3 original figures. (These figures may appear in the Presentation.)

2.2 How your Presentation will be judged

The Presentation (Poster+Talk) contributes 15% to the module credit for MA4K8. You will be assigned to present your poster and give a short (4 minutes) oral presentation, known as a “snapshot” or “lightning talk”, at one of the presentation sessions in Term 2.

2.2.1 Assessment of the content

For both the poster and snapshot talk, marks will be awarded for the following:

- *The suitability of the material.* This includes both the mathematical and non-mathematical aspects. Essentially, does the material fit the theme and is it properly directed at the audience? Is the material successful in conveying the powerful role of mathematics in contemporary life? It is not required that the full theme brief be covered, but something substantial should be covered and covered well.
- The *accuracy* and *quality* of the material.

2.2.2 Assessment of the delivery

For both posters and snapshot talks, marks will be awarded for the medium (poster and computer slides), for communication skills and for the interaction with the audience.

Poster Presentation Marks will be awarded for following aspects:

- *Effectiveness of the poster.* Did the poster get its points across effectively? Did the poster have attractive layout and good visibility. Were pictures and diagrams used effectively? Were colour, type-face, and layout used intelligently to separate the levels of information? Did the visual structure reinforce the logical structure?

Snapshot Talk Marks will be awarded for the following aspects

- Was the speaker fluent, audible, enthusiastic and easy to follow. Were the main points clear and well communicated?
- Were computer slides well used?
- Was the talk well timed?

Online mode of presentation (if necessary and announced on MOODLE)

The quality of the performance part of the poster presentation and snapshot talk depends on aspects outside your control, such as your internet connection, microphone quality, camera quality, and background noise. While marks will be given independently of these technical aspects, please make sure to find an environment where these conditions are optimal. Plan ahead on where you will be physically located when you present your work. Inform

other people in your household about your upcoming presentation to avoid disturbances or bandwidth bottlenecks. Test your camera and microphone setup beforehand.

2.3 How your progress report and draft poster will be judged

By the beginning of Term 2 everybody must submit a Progress Report and draft poster. The Progress Report Form may be found on the [MA4K8 Moodle Page](#) together with an example. You must submit the Progress Report and draft poster in digital form online, by the deadline given on the main module webpage.

The progress report and draft poster contribute 5% to the module credit for MA4K8. The progress report will be assessed based on: the quality and appropriateness of identified sources and their identified role in the project, the clarity of the project scope (what you will cover and not cover in the project), and the clarity of planned work. The draft poster will be assessed based on effort, quality, and originality. It is expected that draft posters may have issues (such as inappropriate font sizes) and may lack certain details. However, it should be clear that the structure and content have been approximately decided.

3 Source material

Your first job for the Maths-in-Action project will be

- to get your hands on all the available information, and
- to assess how reliable it is and how relevant to your theme.

The Academic Support Librarian can help you locate and access relevant sources. They can guide you in finding journals and databases, advise on effective search strategies, and support you in navigating Warwick's library resources and access systems. See <https://warwick.libguides.com/Mathsandstats>

3.1 The Internet

You will surely start with the web. This great repository of knowledge does have its down sides:

Information overload. There is just too much stuff to sift and evaluate.

Credibility gap. Can you believe what you find there? *Anyone* with access to a server or an ISP can publish their Web pages on the Internet.

Experience and intelligent judgement can help with the second. Usually material posted on university web sites, for example, is reliable, but it is **your job to evaluate the credibility of the sources you find on the web.**

Further, consider the following sources on the internet:

Google Scholar and The Science Citation Index lists all the places where a given article or book has been quoted in subsequent articles or books. It is a good way of tracking recent developments in a given circle of ideas. Find one or two seminal works in the area and then see who has been citing them lately. The ULRs are <http://scholar.google.co.uk> and <https://www.webofscience.com/wos/>

MathSciNet is an on-line searchable version of Mathematical Reviews, the American Mathematical Society journal of reviews of (mainly research) articles in learned mathematical journals. The University subscribes to this service which is accessible via the University Intranet. The URL is <http://www.ams.org/mathscinet>

The University of Warwick Online Library Catalogue can be accessed from any Web-linked device and tells you everything you might want to know about the University's stock of books and periodicals. The URL is <http://webcat.warwick.ac.uk/> or <https://warwick.summon.serialssolutions.com/advanced>

3.2 Libraries and bookshops

There are a number of libraries at your disposal.

The Central Campus Library, which houses the main book collections for all the academic disciplines studied at Warwick. The mathematics books usually have call numbers starting with the letters QA. For books on the applications, you may need to consult the "subject" section of the University's online catalogue at <http://webcat.warwick.ac.uk/>

The Mathematics Institute Library. It has a modest collection of advanced undergraduate and research-level books, but more importantly, it houses most of the University's collection of mathematics periodicals (journals). As fourth year MMath students, you have access to the institute library. Please note that books from the mathematics library cannot be taken out of the building; see <https://warwick.ac.uk/fac/sci/math/intranet/facilities/library/>.

Other academic libraries. Books and journals not in the Warwick libraries can be obtained through Inter-Library Loan, e.g. via the [SCONUL access scheme](#). There are often restrictions or costs for borrowing books, but it is ideal for obtaining a photocopy of a journal article or a few pages from a book. See <https://warwick.ac.uk/services/library/using/using-other-libraries/>

Public libraries. They often house good reference collections, will get books on request (but not always quickly), and often provide Internet access.

Bookshops. You may wish to buy a book or two for your Project work. When you own a book, you have unlimited access to it, are free to annotate it, and have the long-lasting pleasure of possession. The University has a [book selling partnership with Blackwells](#), and of course there are reliable Internet suppliers.

3.3 Guidance on use of generative AI

The [MA4K8 Moodle Page](#) has a section with more information about the use of AI. We also refer to the following guidance (in line with general university policy [general university policy 2024/25](#)) here:

"If you do use generative AI in your project, then you must declare it, say which generative AI was used and how, and say why that generative AI was used. This would then be considered when the project is assessed.

And to the Mathematics Undergraduate Handbook page here: [Our AI Policy for Taught Courses](#). Please discuss with the module convenors any use of "generative AI"

4 The Poster and Snapshot Talk Presentation

On the day you will be asked to give a tightly timed (4 minutes) oral presentation, followed by the presentation of your poster after the break. The schedules, talk and poster submission information and further details will appear on the module page. On days that you do not present, you will be expected to attend and engage with the other presentations.

4.1 Your audience

The audience for your presentation is defined to be your fellow MMath students who are in their third year or who are in their fourth year but have chosen a Maths-in-Action Project theme different from yours (i.e. Take their state of knowledge to be the same as yours was at the end of your third year, and *before* you started work on your project.) It is essential that you pitch the language and ideas in your talk and poster to suit your audience.

4.2 How to design and present a poster

You are free to use whatever tools you wish to make your posters. On university PCs, it seems that Microsoft Word and PowerPoint are the two tools best suited. PowerPoint is less constraining, in terms of formats and placement. Depending on your Word version, you might be able to add a custom page size here as well. With PowerPoint you can work directly in A1 format by manually setting the custom size to the dimensions of A1 paper. To print on A4 paper is relatively trivial. Make sure that the final poster has well-resolved figures. Prefer vector graphics over rasterized formats. Avoid using images with large file sizes (as figures or as backgrounds). Generally the file size of the final poster must be less than 5MB. Pay attention to this as you produce your poster.

4.2.1 Designing an effective poster

Regard posters as a pop medium – there is much more freedom to communicate visually than in a written report. The visual and logical structure should work hand in hand. Visual structure is provided by

- the use of type (size, colour, weight and font)
- the lay-out of blocks of text
- the use and positioning of pictures and diagrams

Logical structure is typically: a Beginning, a Middle, and an End.

- Beginning: Grab attention and state your intentions.
- Middle: List your points (not too many) and hammer them home.
- End: Sum up, rest your case (and possibly point to new directions).

More concretely, for poster content, consider the following advice:

- The question, idea, or problem underlying the poster should be clearly conveyed to non-experts in a short space. There are many approaches here: short abstract, list key questions or even one question, an interesting fact that calls out for explanation, etc. (You might ask: why should anyone care about this and can I get this across simply in a small amount of space. Use an image if it helps.)

- It must be clear by the end what has been achieved, shown, or explained. What does it all mean?
- If appropriate, list future directions or other content not covered in the poster.
- The author, institution, acknowledgements (if any) and references must be appropriately included.

In terms of style keep the following points in mind:

- Use big type. 20-point fonts are about right for most text. It is to readable at a distance and it forces you to say less. Do not get carried away – keep the fonts simple and readable. You probably want to use 2 or maybe 3 font sizes (excluding the title). References may be in small font relative to other fonts on the poster.
- Make titles readable from far away – say, at least 5 meters. DON'T USE ALL CAPS, IT'S HARD TO READ.
- Keep the text short. It's not an article or report. Unlike almost anything else you write, posters do not have to contain complete sentences. Think captions.
- Avoid jargon that your audience will not understand.
- As a rule, columns work best for visual formatting: people can read from top to bottom, then move over to the right and read next column. However, some very good posters use different, creative but clear, formatting.
- You may use numbering or other labelling to guide the reader. If you do, keep it clean and simple.
- Figures are crucial. They must be appropriately sized, neither too big nor too small for their content. They should be clearly readable and must have captions. Anticipate that some people will read your poster only by reading the figure captions. Again, complete sentences are not required.
- A background can be pleasing, but it should not overwhelm.
- Do not go overboard on colour.

Note on references. You must include URLs or some other referencing for any images you use on your poster (that you did not create yourself). Generally, good practice to list a least a few key references to the work as a whole. The fonts for references can be small (e.g. 14-16 point).

4.2.2 Presenting a poster

You should be prepared to explain your poster in a brief coherent fashion and be prepared to answer questions about the project theme.

Here are some key points to consider when presenting the poster:

- Do not become so engrossed in conversation with any single individual that you accidentally prevent others from talking to you about your poster.
- Do not expect anyone to spend more than 3–5 min (tops!) at your poster. If you cannot clearly convey your message pictorially in less time than this, chances are you have not done the job properly.
- Prepare a set explanation of your poster that takes about 4 minutes. If people ask questions and are especially engaged, this can be extended, but prepare a 4-minute summary.

4.2.3 Some practical tips to be found on the Web

- The following site is a good starting point and includes a list of poster-making links at the end: [The archive as classroom. Appendix G: Poster Presentation](#)

4.3 How to give a poster “snapshot” (short talk)

Each presentation session will begin with a series of snapshots – short oral presentations on the theme. You will give a 4 minute “snapshot” talk introducing the audience to the topic of your project. The slides will be preloaded. It is common to end the talk with “for further details, please come talk with me at my poster” or something similar. A timer will be visible during your presentation. The timing will be strictly enforced. There will be no questions at the end of each talk. Questions can be asked during the poster session.

Your focus should be the same content as the poster. This is as an opportunity to introduce the poster and get the essential message across in a different medium. You want to exploit the opportunities that a talk provides. The talks will take place in one of the seminar rooms. Unless you have consent from the organisers, your presentation must be in Microsoft Power Point or in PDF. Time constraints are such that all presentations will be uploaded prior to the session. Since the talks will be very short, you should practise.

Much as with the poster itself, your aim will be:

- To grab the attention of your audience
- To convey the essential message and ideas
- To send them away enthused and prepared to come visit your poster

Here are some practical things to think about:

- Speak clearly and at a comfortable speed. Pause at suitable points.
- Talks are a different form of communication from posters. Use this to your advantage. For example, this is where to include animations and videos. Ensure to embed video so that it runs on other machines.
- Engage your audience and be proud to share with them your knowledge and enthusiasm for your subject.
- Let your manner be good-humoured, but avoid forced humour – you are a scholar, not a comedian, and will be respected as such.
- Produce clear and legible slides.
- Prepare thoroughly and rehearse the talk.
- Finish on time! Timings will be strict!

4.3.1 Sources of good advice on giving a talk

- Chapters 10 and 11 (entitled “Writing a Talk” and “Giving a Talk”, respectively) in the Second Edition of Nicholas Higham’s
“Handbook of Writing for the Mathematical Sciences”

published by SIAM in 1998 (ISBN 0-89871-420-6). There is a copy in Central Campus Library with classification number QA 41 .H4.

- (ii) Steven Krantz has his own Ten Commandments for giving a talk on pages 128–134 of his entertaining and opinionated book

“A Primer of Mathematical Writing”

It was reprinted by the American Mathematical Society in 1998 (ISBN 0-8218-0635-1) and a copy can be found in Central Campus Library with classification number QA 41 .K7.

- (iii) Here are two accessible short articles:

“How to talk Mathematics” by Paul Halmos, and

“How to Give a Good Talk” by Joe Gallian.

The Halmos article appears in the *Notices of the American Mathematics Society*, Volume 21 (1974), pages 155-158, while a PDF of Gallian’s essay can be easily found with Google.

- (iv) As usual, there is plenty of good advice on the Web.

5 The Scholarly Report

Important

The Scholarly Report must be your individual and personal work. The choice of material and the way it is presented must be entirely your own.

The main body of the scholarly report **must** use the Latex template file provided on the Maths-in-Action Resources page and it **must not exceed 30 pages** (excluding the title page, table of contents and the list of references). If necessary, additional information may be included in the form of appendices (for example you may include a printout of a computer program) but you have to structure your report in such a way that the markers should be able to judge your report without this additional information. Appendices do not count towards the page limit. **Note: under no circumstances can you change the page margins, line spacing or text font size from those in the template.**

If your report does not satisfy these requirements, it is likely that your report will be returned to you and a resubmission required.

5.1 Your audience

The audience for your scholarly report is defined to be your fellow fourth-year MMath students who have chosen a Maths-in-Action Project theme different from yours. (Take their state of knowledge to be the same as yours was *before* you started work on your project.)

5.2 What does ‘scholarly’ mean?

In a nutshell, the word ‘scholarly’ here means:

- The mathematics must be correct and relevant
- The accompanying narrative should be cogent, economical, lively, and above-all persuasive
- The report must follow the brief stated in the [Theme Guide](#)
- The spelling and grammar should follow the current conventions of well-written English
- The layout on the page should be consistent with the style of a good mathematics textbook
- The story should be yours and told in your own words

5.3 How long should I spend on the project?

Bear in mind that the core module MA4K8 Project is worth 30 CATS and represents 25% of your overall course credit for the final MMath year. You should therefore expect to spend in the region of 300 hours on its various components.

Some food for thought:

- Beware the temptation of spending too little time on the Project in Term 1;
- The range of skills and abilities used in the Project are different from those needed in a conventional timed maths exam. Take advantage of this chance to show your versatility;
- Divide your time between the Project components (Presentation, Scholarly Report, and Popular Article) roughly proportional to the credit they earn;

- The Project components will each be marked in a range from 0% to 100% like a maths exam;
- It is advisable to set aside sizeable chunks of time to work on your Project because longer periods of concentration are more efficient.

5.4 The creative process, from start to submission

Follow these recommended steps to produce your report:

- Gather together all the available materials (books, articles, Web pages); then read at length and in depth around your chosen subject, bearing in mind that you need to know much more than will appear in your report.
- Make a selection of material that fits the brief outlined in the [Theme Guide](#). Make sure you have a good story to tell!
- Settle on a structure for your report (see the next section).
- Prepare a framework for your document, listing the ideas you want to get across and the mathematical scaffolding that will support them. Plan chapter and section headings to reflect your chosen structure.
- Now write a first draft of the whole report (introductory and concluding chapters are best written last). Then put it away for a few days and try to forget about it.
- After this fallow period, re-read and revise your first draft. Be prepared to prune both your material and your prose.
- Show your second draft to one or two literate mathematical friends who know you well enough to offer helpful criticism. Heed their comments and prune again.
- Produce a final draft, do a spell check, make sure the references to earlier results bear the right numbers and that the labels on the citations tally with the corresponding items in your bibliography. Once more put the document on ice.
- Re-read your report with pride and pleasure, edit lightly, and then SUBMIT in good time for the deadline.

5.4.1 Structuring your report

There are many ways of telling a story (think of the books you have read and the films you have seen). You can gradually build to a final climax with cliff-hangers along the way. You can reveal all at the start and use flash-backs to show how you got there. You can present your material in the form of a personal odyssey from ignorance to enlightenment (writing in the first- person 'I') or give a historical perspective, describing how the work of key players contributed to the development of the ideas.

Whichever format you choose, the basic underlying structure should have a beginning, a middle, and an end.

- The *beginning* might contain *two* kinds of introduction. In the *first* you state your brief and describe the scope of your theme, its background and context, why you find it interesting and/or important, and why you chose it.
- In a *second* introduction, you gather up all the preparatory results and ideas that will be needed in the main body (in a short work like this, do not expect to prove every mathematical result from first principles, but do state them clearly and give references in the literature for their proofs).

- The *middle* is where you unfold your story and make your case. It contains the meat, your main results and arguments, the heart of the matter. Here you aim to demonstrate mathematics in action by proving theorems and showing how their conclusions are applied to real-life problems. Here you can be creative by devising examples that illustrate the ideas and results you have described.
- When you get to the *end*, safely assume the readers have forgotten the beginning and most of the middle, so tell them again what you have done (preferably in fresh ways), why it was appropriate, and hint at what you might have done if you had had more space and time.
- Most importantly, the *end* should end with a list of references, in fact, ALL the references you have consulted, not just the ones you have cited in the course of your report (you might wish to include an evaluation of your references). There are various styles of referencing: pick up a few books, compare their styles, and choose the one that you find most pleasing.

5.4.2 Style and presentation

What constitutes good style and attractive presentation is not uniquely defined. There are broadly-agreed conventions about spelling, grammar, and the layout of mathematics on the page, but these are sometimes disputed in the detail.

Good style makes a document comfortable to read and easy to understand. The writing and presentation should reinforce meaning and aid its assimilation. Good style should not jar, get in the way, or intrude on the reader's consciousness.

We do not want to impose strong views about style on you. There are excellent books on this very personal subject and you must develop your own canons of good taste. To help you do this, we recommend the following 3 books (already cited earlier in this Guide); they in turn make their own recommendations for further reading.

- *How to write mathematics* by N.E. Steenrod, P.R. Halmos, M.M. Schiffer and J.A. Dieudonné
- *Handbook of Writing for the Mathematical Sciences* by N.J. Higham
- *A Primer of Mathematical Writing* by S.G. Krantz

These books will convince you that there is much to be learned when it comes to writing well, particularly when writing mathematics.

5.4.3 Plagiarism

Important

It is important that you avoid plagiarism.

This does not mean that all of the ideas in the project are purely your own, in fact, we expect very few (or even none) of the ideas to be purely your own, but expect them to come mainly from books or other reputable sources. The originality of the project should come from how you collate information from these sources and put them together in a new way, creating a new and interesting exposition on the topic.

To avoid plagiarism there are a number of things that you should do:

- always give careful references (citations) when an idea is not your own

- combine ideas from various sources together to create an original structure to your project
- re-write the ideas in your own words.

When re-writing the ideas in your own words, this does not mean it is fine or good practise to just change a few words, symbols, or notation. Also note that when you re-write ideas in your own words, you should still give proper reference to your original source(s).

Important

Make it absolutely clear throughout which is your own work and which is derived from other sources. Cite your sources frequently.

Familiarise yourself with [UG hnadbook: Academic Integrity and AI](#)

6 Progress report and draft poster

By the beginning of Term 2 everybody must submit a Progress Report and draft poster. The Progress Report Form may be found on the [MA4K8 Moodle Page](#) together with an example. You must submit the Progress Report and draft poster in digital form online (typed), by the deadline given on the [MA4K8 Moodle Page](#).

7 Popular articles

- All Maths-in-Action reports are to be accompanied by a short Popular Article aimed at the general public. The popular article is separate from the above report. This means it is to be submitted as separate document and its length does not contribute to the page limit of the Scholarly Report.
- The target length is 1000 to 1500 words. An absolute upper bound is 3000 words.
- The article should contain at least one and up to three original figures. These are key to having a lively article.
- While the scholarly report must be in Latex, the popular article probably should be typeset with Word or something similar. It should contain few equations, although it may contain a few, and you should explore a variety of font sizes and other techniques to make your article lively and readable on multiple levels. Again, good figures are a must. See the examples below.
- You should model your popular article after a typical [Scientific American](#) article such as [Never say never](#) and [Machines that think for themselves](#). Other Scientific American articles can be obtained via the library (Encore) if you want further examples. You may also chose to model your popular article after a news paper article, although these typically report recent advances and they may not match closely to Maths-in-Action projects.
- The [MA4K8 Moodle Page](#) contains examples of some past examples of Popular Articles written by former students. You will be rewarded for creativity, so do not follow any one example too closely. Find some spin on your topic and tell your own story!

The notion of a popular mathematics article is exemplified by contributions to the online +plus magazine <https://plus.maths.org/content/> and the IMA magazine [Mathematics Today](#) which can be found in the Mathematics Institute Library.

8 Avoiding past mistakes

This advice is based on the examiners' observations of recent years' MIA Project Work:

8.1 Presentations

- (a) The presentation should convey clearly that mathematics is behind the project.
- (b) Persuade your audience that mathematics has a real impact.
- (c) Make sure you know your subject really well and have some in reserve. When standing at your poster, be prepared to answer questions.
- (d) Keep your talk to within the allotted time without rushing at the end. Practise.
- (e) The balance between breadth and detail is very delicate. Both the poster and the verbal snapshot require time to prepare. Do not wait until the last minute.

8.2 Scholarly Reports and Popular Articles

- (a) Make sure your Report is a consistent whole. Don't change notations partway through.
- (b) Make sure the notation in the figures is the same as in the text.
- (c) Provide figure captions.
- (d) Make every sentence say exactly what you mean.
- (e) Make every word and phrase count. Avoid clichés and the tabloid style.
- (f) Avoid repetition. Get your ideas across accurately and economically.
- (g) Justify every claim you make (with an argument or a reliable reference).
- (h) Cite all the sources you use at the point where you use them (referring to a fully annotated bibliography). Make it very clear which are your own contributions in ideas, examples, proofs and pictures. Learn the meaning of 'plagiarism' and strictly avoid it.
- (i) Say where your diagrams and graphics come from, and whether they are your own work.
- (j) Learn to punctuate (for instance, read [Eats, Shoots & Leaves](#) by Lynne Truss). Get a literate friend to proof-read your final draft.
- (k) Make sure you spend adequate time on the popular article. They are not long in word count, but they must be lively and well designed. Format and typeset in lively attractive style.