

# A Review of the Engineering Maths First Aid Kit and the Algebra Refresher

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## Abstract

New support mechanisms have been introduced for Engineering students in their first year at Lancaster University to help maintain standards in all subject areas that are underpinned by Mathematics. Resources that have already been developed by Loughborough University are being used in a slightly modified form to help students to work through and overcome any weakness in Mathematics. Help sheets from Engineering Maths First Aid Kit are used to reinforce student learning. All material is used with the help of tutors to form a good foundation for further studies.

## The Execution

The Department of Engineering at Lancaster University has a policy of course assessment that leads to discussion of teaching techniques and the current relevance of course content. Following such an assessment, it was decided to carry out a review of the Mathematics modules common to all the first year students taking Engineering degrees.

Concerns were expressed that standards in Mathematics had been falling for some time, particularly the ability to deal easily with algebraic manipulation. The loss of this particular skill was felt to be causing problems, not only in Mathematics, but also across the full spectrum of Engineering modules. Lowering of standards was not considered to be acceptable, as this would cause problems in the later years of the degree. Finding a method of supporting students with areas of weakness in Mathematics was deemed to be an appropriate way forward.

This support has been put into operation at the beginning of the current academic year, 2001/2002 and consists of support prior to starting at the University and extra resources during the first year of study.

### This support is in three parts:

- Prior to starting at the university, a student who has been accepted for an Engineering course with a non A-level qualification in Mathematics or who has achieved D or E grades at A-level, was sent an adapted copy of 'An Algebra Refresher', the booklet designed by the Mathematics Learning Support Centre of Loughborough University. A letter was sent with this booklet encouraging the student to work through the questions and to contact the tutor concerned with support if problems arose. This was followed by a telephone call by the tutor to all such students to check on progress.
- A diagnostic test is given in the first Mathematics lecture. This is not a multi-choice test so the method of solution is considered to be as important as the correct answer. The questions are designed to contain repeated elements, such as expanding brackets, so that individual areas of weakness can be identified before the end of the first week of study. Any problem areas are explained to the student and help sheets from the 'Engineering Maths First Aid Kit' are supplied in appropriate topics.
- At the end of each week of study, workshops are held for students to work through examples with help from tutors where necessary. The ratio of students to staff gives the opportunity for one-to-one teaching, with help sheets from the 'Engineering Maths First Aid Kit' being offered where the tutors or, more often, the students feel these would be helpful.

Two booklets have been considered for the pre-university support, both developed by Loughborough University.

- 'Foundations of Engineering Maths, a Refresher', contains useful topics other than algebra such as basic trigonometry, logarithms and polar co-ordinates. The format of this booklet leaves very small spaces in which to work and is based on multi-choice answers. The format is felt to be less inviting than that of 'An Algebra Refresher'.
- 'An Algebra Refresher' is not multi-choice and contains many more exercises for the student. The format leaves large, blank spaces which invite the student to write down the working so that this forms part of the booklet, a good technique for revision. As the lack of algebraic skills is the main concern, this booklet is considered to be the correct choice in this case. However, the original booklet contains work that is somewhat beyond the level required and the last two sections, 'Solving Some Polynomial Equations' and 'Partial Fractions', were removed. Both of these topics are taught in the first five weeks of study and for some non A-level students these topics are new rather than revision.

The use of the 'Engineering Maths First Aid Kit' has enabled the students to take more decisive action when further practice is needed. The help sheets from this pack have become a popular source of help, not only for students whose Maths is generally weak, but also for those who need help in specific areas. A new help sheet on error bounds had to be hastily produced to meet the requests of students. This will be revised and added to the list for the next academic year. Help sheets on other topics such as differential equations may well be developed in the near future. The help sheets are available at all times from the Engineering Office so that the information is available for other Engineering subjects as well as just for Mathematics.

## What Support Was Needed?

The support is being offered to the students by a tutor who has worked in schools and in Further Education. The tutor has specialised in teaching Mathematics to Engineering students for some years and is well aware of the problems that some of the non A-level students face. No formal staff training has been given but a copy of the 'Engineering Maths First Aid Kit' has been made available to all tutors involved in teaching first year Engineering courses. The methods of introducing the help sheets from this pack were discussed before the start of the current academic year. There are two tutors involved in the workshops who have many years' experience in both schools and Further Education colleges. The diagnostic test seeks to identify students who are likely to have difficulties with Maths and to put the students into workshop groups led by these two tutors.

# Engineering Maths First Aid Kit

**David Baud**



## **Engineering Maths First Aid Kit:**

This book delves into Engineering Maths First Aid Kit. Engineering Maths First Aid Kit is an essential topic that needs to be grasped by everyone, from students and scholars to the general public. The book will furnish comprehensive and in-depth insights into Engineering Maths First Aid Kit, encompassing both the fundamentals and more intricate discussions.

1. The book is structured into several chapters, namely:
    - Chapter 1: Introduction to Engineering Maths First Aid Kit
    - Chapter 2: Essential Elements of Engineering Maths First Aid Kit
    - Chapter 3: Engineering Maths First Aid Kit in Everyday Life
    - Chapter 4: Engineering Maths First Aid Kit in Specific Contexts
    - Chapter 5: Conclusion
  2. In chapter 1, the author will provide an overview of Engineering Maths First Aid Kit. The first chapter will explore what Engineering Maths First Aid Kit is, why Engineering Maths First Aid Kit is vital, and how to effectively learn about Engineering Maths First Aid Kit.
  3. In chapter 2, this book will delve into the foundational concepts of Engineering Maths First Aid Kit. The second chapter will elucidate the essential principles that need to be understood to grasp Engineering Maths First Aid Kit in its entirety.
  4. In chapter 3, this book will examine the practical applications of Engineering Maths First Aid Kit in daily life. The third chapter will showcase real-world examples of how Engineering Maths First Aid Kit can be effectively utilized in everyday scenarios.
  5. In chapter 4, this book will scrutinize the relevance of Engineering Maths First Aid Kit in specific contexts. The fourth chapter will explore how Engineering Maths First Aid Kit is applied in specialized fields, such as education, business, and technology.
  6. In chapter 5, this book will draw a conclusion about Engineering Maths First Aid Kit. The final chapter will summarize the key points that have been discussed throughout the book.
- The book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Engineering Maths First Aid Kit.

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