Unit 1 *Mathematical Modelling* Introduction

Learning objectives

This unit develops one of the key underlying themes of Core Maths - that of mathematical modelling. After completing the unit you should

- understand how mathematics is applied in contexts
- appreciate the use of mathematical modelling in mathematical applications to explain, confirm or predict phenomena
- have gained confidence in solving real world problems.

Notes

Mathematical modelling is not a new concept as we have been using mathematics to solve real world problems throughout history. The most well-know example is Newton's Laws of Motion that act as the model for all mechanical problems. It has shown its usefulness both in explaining the motion of planets and in providing the solutions for GPS technology.

There are of course many diverse applications of mathematics across a range of disciplines from traditional science subjects such as Physics, Chemistry, Biology and Medicine to Social Sciences including Geography, Psychology and Politics!

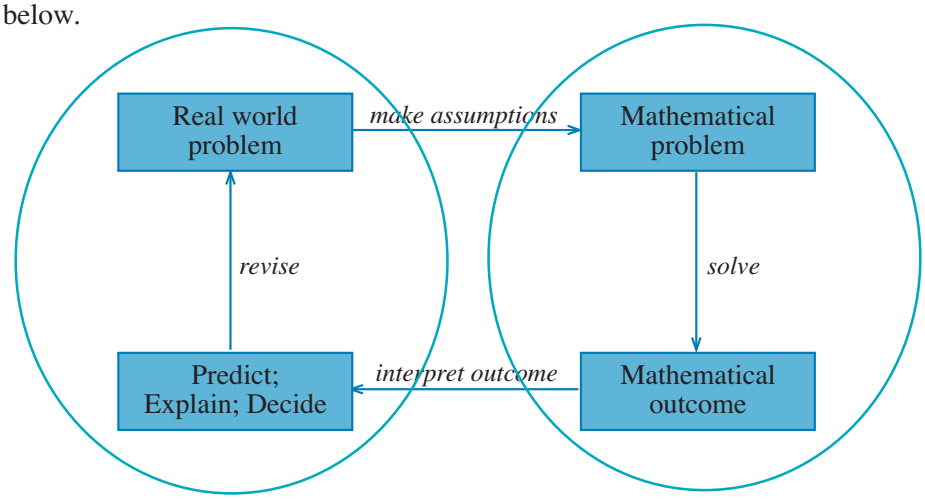
Although we concentrate here on mathematical modelling, there is also a vast number of applications that are based on statistical modelling. This is covered in the units in the Statistics Strand.

Another important area of application is that of coding; many of our activities depend on having efficient codes (for example, bar codes) in everyday life. We also use, for example, compression models in new technology and the use of internet security is crucial in today's society.

Sometimes it is difficult to see or understand how the mathematical model is being used: for example, the coding used for tickets on Network Rail is just a black strip but this strip contains all the information needed to ensure that you use the ticket on the right day and on the specified route, satisfying various time restrictions, and that, once used, it cannot be used again!

Key points

- Mathematical models can be used to predict, explain, confirm and decide as summarised in the diagram below.



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- Whilst mathematics gives exact answers, mathematical modelling is less precise and the interpretation and validity of answers is crucial.

Glossary

- *Mathematical model*: this is typically a formula, equation or design that models the real world situation and/or provides a solution to a real world problem.