

# What does it mean to study mathematics?

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The goal of this note is to provide a clear information to students with a bachelor other than mathematics or a bachelor mathematics from a university of applied sciences (HBO in Dutch; Fachhochschule in German). The information is divided into two parts: information on applications of mathematics and information on the level of mathematics.

## APPLICATIONS OF MATHEMATICS

In order to get some idea about the wide range of applications of mathematics, the best way is to read about explicit examples. The Dutch Mathematics Platform has a nice booklet (in Dutch) that can be downloaded for free: [http://www.platformwiskunde.nl/wp-content/uploads/2016/10/PWNsuccesformules\\_LowRes.pdf](http://www.platformwiskunde.nl/wp-content/uploads/2016/10/PWNsuccesformules_LowRes.pdf). Extensive success stories in English can be downloaded for free from the German research institute Matheon through [https://www.matheon.de/downloadFile.php?file=public\\_access/media/booklets/matheon\\_showcases.pdf](https://www.matheon.de/downloadFile.php?file=public_access/media/booklets/matheon_showcases.pdf).

## LEVELS OF MATHEMATICS

The main point is that there is a huge difference between mathematics courses for non-mathematicians and mathematics courses for university students studying mathematics. Mathematics courses for non-mathematicians usually focus exclusively on how to apply mathematical methods, while courses for mathematics students at universities heavily deal with the background of the methods. The reason is that this category of students should also learn to develop new mathematical methods together with a formal justification of the correctness of these methods. This justification comes in the form of mathematical proofs. The consequence of this that in order to be able to successfully enter a Master's programme on mathematics, you not only need to know the necessary mathematical methods, but you should also be well trained in giving and reading mathematical proofs. A nice example what this last item entails can be found at <https://www.birmingham.ac.uk/Documents/college-eps/college/stem/Student-Summer-Education-Internships/Proof-and-Reasoning.pdf>. Perhaps the following analogy illustrates the main point: many people know how to drive a car and do some minimal repairs like replacing a tire or refilling the oil level, but they do not know how an engine really works and how to do serious repairs. A trained mechanic knows exactly how an engine works and can do serious repairs and adjustments.

