

Overcoming language barriers in Mathematics

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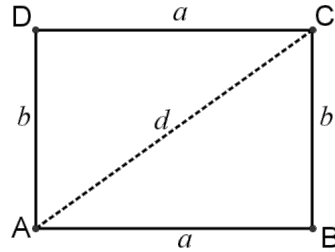
UNIVERSITY OF
BATH

mash
Mathematics Resources Centre

Mathematics &
Statistics Help

Personal Reflection

What is a rectangle?



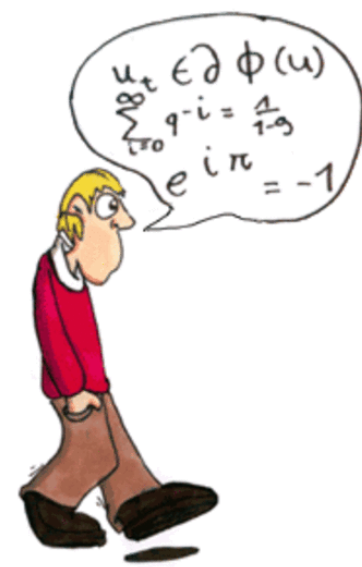
Should I raise my hand and ask?
Is anyone else having the same problem?

Simple words getting the better of me

How can I explain a problem to friends?

The feeling of having to relearn most topics

Language Barriers for Bilingual Students: Literature Review



- Is mathematics really a universal language?
 - Test results relate to language competency ^[1]
- The English language – homophones, homonyms, ...
- Students computing in their native language
- Wordy maths questions
- Terms associated with basic mathematics cause difficulty
 - Familiarity with everyday language may not be enough with regards to mathematical terms

[1] Ní Ríordáin, Maire, and John O'Donoghue. "Challenges Faced by Gaeilgeoirí in the Transition to English Medium Second Level Maths Education." Paper presented at ICME-11, Monterrey, Mexico, 2008

Language Barriers for All Students

- Abbreviations
- Latin/Greek/other
- Notation
- Homonyms, synonyms, ...

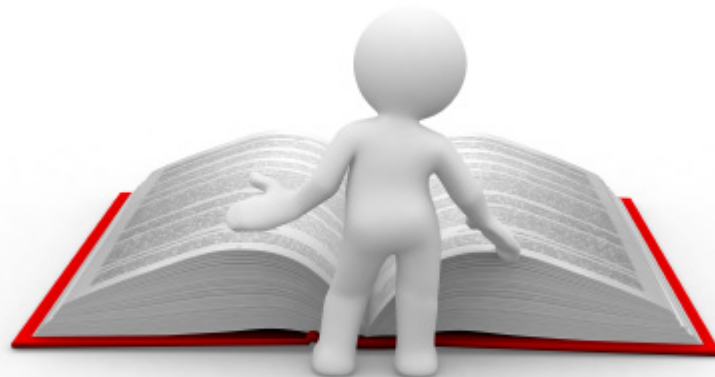


Resource Development

1. Glossary of mathematical words and phrases
2. Bilingual dictionary
 - Online version of both
 - Website which will update over time with crowdsourced translations

1. Glossary

- Separate list of unfamiliar/technical phrases and acronyms
- Definitions also included
- Examples where appropriate



Unfamiliar Phrases & Acronyms

Students coming into HE may not have seen or used unfamiliar phrases appropriately.

Lemma - a subsidiary or intermediate theorem in an argument or proof

Reductio ad absurdum - reduction to absurdity (proof by contradiction)

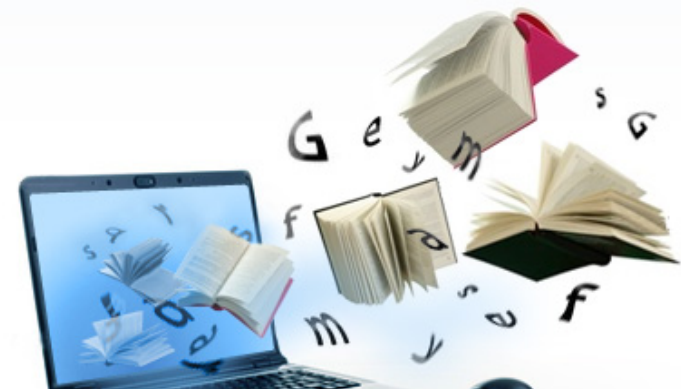
e.g. - exempli gratia

w.l.o.g - without loss of generality



2. Bilingual Dictionary

- First version of the bilingual dictionary is in Welsh
- Organised by area of mathematics
- Physical dictionary will be alphabetised in English
- Feedback from first year students with a Welsh-speaking background



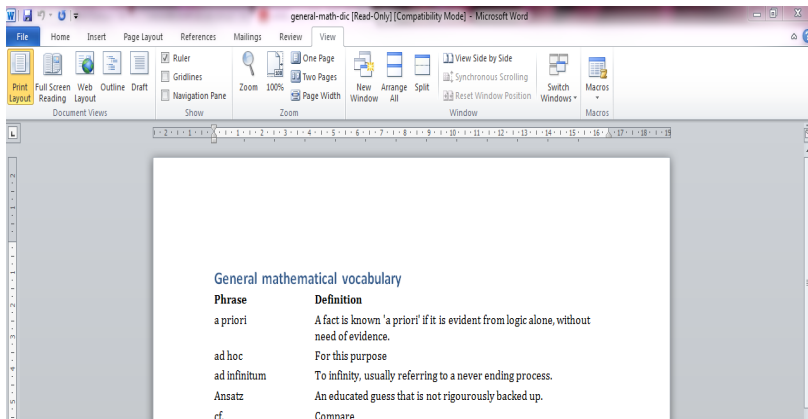
Screenshots – Glossary

General mathematical vocabulary

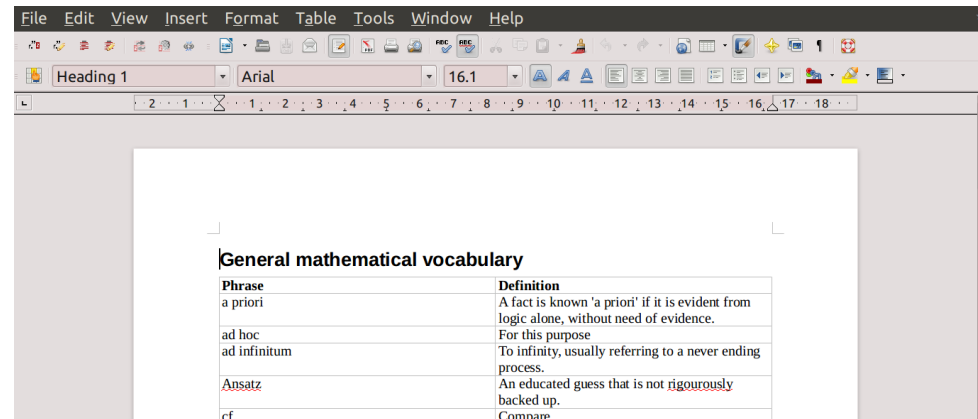
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Phrase	Definition
a priori	A fact is known 'a priori' if it is evident from logic alone, without need of evidence.
ad hoc	For this purpose
ad infinitum	To infinity, usually referring to a never ending process.
Ansatz	An educated guess that is not rigourously backed up.
cf	

Word document:



ODT document:



Screenshots – Bilingual dictionary


Bilingual resource and project status

Language (Local)	Language (English)	Word format	Basic word set	Status
Cymraeg	Welsh	Welsh (Word) Welsh (ODT)	Available	Complete!
العربية	Arabic	Arabic (Word) Arabic (ODT)	Proofreader required	Translators required
Български	Bulgarian	Bulgarian (Word) Bulgarian (ODT)	Proofreader required	Translators required
Česky	Czech	Czech (Word)	Proofreader required	Translators required

Calculus / Analysis

English	Cymraeg
Analysis	Dadansoddiad
Calculus	Calcwlws
Chain Rule	Rheol Cadwyn
Compact	Cryno
Continuous	Di-dor

Crowdin – collating and checking translations

 [Start Own Project](#) [Plans & Pricing](#) [Help](#) [Quickstart](#)

mash-lang's projects / [sigma-lang](#)

sigma-lang

Welcome to sigma-lang translations!

You have been invited as translator to the sigma-lang translation project.
Sign up for free or login and you will join the project automatically.



















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Needs Translation:

 Arabic translated: 0%	 Bulgarian translated: 0%	 Chinese Simplified translated: 0%	 Croatian translated: 0%	 Czech translated: 0%	 Danish translated: 0%
 Dutch translated: 0%	 Estonian translated: 0%	 Finnish translated: 0%	 French translated: 0%	 German translated: 1%	 Greek translated: 0%
					

We Need YOU!

- Sign up to Crowdin and become a translator/proofreader
 - Translator: can be anyone, any language
 - Proofreader: approves entries, must be staff / Year 3+
- Tell people about it!
 - Do you know anyone who would **benefit from** this online resource?
 - Do you know anyone who can **contribute to** this online resource?



Thank You!

We would like to thank **sigma** for providing us with the opportunity to help future mathematics students overcome their language barriers; and hope to see a lot more effort going in to supporting English second language learners not only in mathematics, but in all subjects.

Thank you for listening!

Any questions or comments?

**Please see our leaflet for further
details on how you can help**



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www.bath.ac.uk/study/mash/lang/