ATAR Notes

QCE Maths Methods Units 1&2 Complete Course Notes 2023–2025

Vinh Nguyen

Published by InStudent Publishing Pty Ltd L 1 223 Hawthorn Rd Caulfield North, Victoria, 3161 Phone (03) 9916 7760

www.atarnotes.com

As and when required, content updates and amendments will be published at: atarnotes.com/product-updates.

Copyright © InStudent Publishing Pty Ltd 2023

ABN: 75 624 188 101

All rights reserved. These notes are protected by copyright owned by InStudent Publishing Pty Ltd and you may not reproduce, disseminate, or communicate to the public the whole or a substantial part thereof except as permitted at law or with the prior written consent of InStudent Publishing Pty Ltd.

We acknowledge the Wurundjeri people of the Kulin nation as the traditional owners of the land on which this text was created. We pay our respects to Elders past, present, and future and acknowledge that this land we work on is, and always will be, Wurundjeri land.

Title: QCE Maths Methods Units 1&2 Complete Course Notes

ISBN: 978-1-922818-74-4

Disclaimer

No reliance on warranty. These ATAR Notes materials are intended to supplement but are not intended to replace or to be any substitute for your regular school attendance, for referring to prescribed texts or for your own note taking. You are responsible for following the appropriate syllabus, attending school classes and maintaining good study practices. It is your responsibility to evaluate the accuracy of any information, opinions and advice in these materials. Under no circumstance will InStudent Media Pty Ltd ("InStudent Media") or InStudent Publishing ("InStudent Publishing"), its officers, agents and employees be liable for any loss or damage caused by your reliance on these materials, including any adverse impact upon your performance or result in any academic subject as a result of your use or reliance on the materials. You accept that all information provided or made available by InStudent Media and InStudent Publishing is in the nature of general information and does not constitute advice. It is not guaranteed to be error-free and you should always independently verify any information, including through use of a professional teacher and other reliable resources. To the extent permissible at law InStudent Media and InStudent Publishing expressly disclaims all warranties or guarantees of any kind, whether express or implied, including without limitation any warranties concerning the accuracy or content of information provided in these materials or other fitness for purpose. InStudent Media and InStudent Publishing shall not be liable for any direct, indirect, special, incidental, consequential or punitive damages of any kind. You agree to indemnify InStudent Media and InStudent Publishing, its officers, agents and employees against any loss whatsoever by using these materials.

Trademarks

"ATAR" is a registered trademark of the Victorian Tertiary Admissions Centre ("VTAC"). The QCAA and VTAC do not endorse or make any warranties regarding this study resource.

Preface

Welcome to Mathematical Methods Units 1&2! I'm Vinh Nguyen, a past student who has taken both the Methods and Specialist Maths courses, here to guide you through this challenging – but reasonable – subject. I have always taken a liking to mathematics throughout high school, and in these notes, I will give you all the tips and tricks I've learned along the way.

Right off the bat, you may have chosen this course for a variety of reasons, such as for university prerequisites, but the best tip I can give right now if you are just starting this course is to **persevere through the beginning!** It can be a jolting step up from your previous maths classes. In my experience, I would say over half of the students in my Methods cohort dropped the course by the end of Unit 1. So, be prepared to put in the effort to study and set feasible expectations for yourself, and don't worry if you find things a bit challenging at first.

Remember that your final ATAR result depends solely on assessments in Units 3&4, so your performance in Units 1&2 won't *directly* count. However, don't be fooled — many students will 'take it easy' in Year 11 and think that they can 'start fresh' in Year 12 if things go awry. For Methods, Units 3&4 directly build on the content in Units 1&2, so it is absolutely necessary to pay attention now! Whilst undertaking Units 3&4 of Methods, I found that many students had to go back to relearn the basics of topics like trigonometric functions — while you will inevitably forget some things, do your best to avoid this scenario, and you'll make Year 12 much easier for yourself!

Finally, Maths Methods is a 'doing' subject; the best way for you to use this book is to go through the examples to understand how the concepts are applied, then try to practise some questions for yourself until the theory really sticks with you. If you study regularly and make sure to practise problems every time you cover a new topic, you'll be well on your way to success in Units 1&2!

- Vinh Nguyen

Contents

ı	Unit	t 1: Algebra, statistics, and functions
1	Arith	nmetic sequences and series
	1.1	Arithmetic sequences
	1.2	Arithmetic series
2	Fund	ctions and graphs
	2.1	Reviewing relations, domain, and range
	2.2	Functions
		2.2.1 Vertical line test
		2.2.2 Function notation
		2.2.3 Translations of functions
		2.2.4 Dilations of functions
		2.2.5 Reflections of functions
		2.2.6 Piecewise functions
		2.2.7 Applying functions
	2.3	Review of quadratic relationships
		2.3.1 Using factorisation
		2.3.2 Using the quadratic formula
		2.3.3 Completing the square
		2.3.4 Using a calculator
		2.3.5 The discriminant
		2.3.6 Problem solving questions involving quadratics
	2.4	Inverse proportions
	2.5	Powers and polynomials
	2.6	Graphs of relations
3	Cou	nting and probability 29
	3.1	Sample spaces and probability
	3.2	Multi-stage experiments
	3.3	The addition rule
	3.4	Conditional probability
	3.5	Independent events
	3.6	Counting methods and binomial expansion
		3.6.1 Arrangements
		3.6.2 Combinations
4	Expo	onential functions 1 39
	4.1	Indices and the index laws
	4.2	Rational indices
	4.3	Scientific notation
5	Geo	metric sequences and series 41
	5.1	Geometric sequences
	5.2	Geometric series
	5.3	Applications of compound interest

Ш	Uni	t 2: Calculus and further functions	43
1	Ехр	onential functions 2	44
	1.1	Graphs and transformations of exponentials	44
	1.2	Solving exponential functions	46
2	The	logarithmic function 1	47
	2.1	Introduction to logs	47
3	Trigo	onometric functions 1	50
	3.1	Circular measure and radian measure	50
	3.2	Introduction to trigonometric functions	51
	3.3	Exact values	53
	3.4	Graphs of trigonometric functions	54
	3.5	Symmetry properties of trigonometric functions	57
	3.6	Solving trigonometric functions	59
	3.7	Graphs of trigonometric functions continued	61
	3.8	Applications of trigonometric functions	62
4	Intro	duction to differential calculus	63
	4.1	Rates of change and the concept of derivatives	63
	4.2	Properties and computation of derivatives	65
	4.3	Applications of derivatives	66
		4.3.1 Equation of the tangent	66
		4.3.2 Kinematics	67
		4.3.3 Stationary points	67
5	Furt	her differentiation and applications 1	71
	5.1	The chain rule	71
	5.2	The product rule	71
	5.3	The quotient rule	72
6	Disc	rete random variables 1	73
	6.1	General discrete random variables	73
	6.2	Determining discrete probability distributions	75
		6.2.1 Using a set of data	75
		6.2.2 Uniform discrete random variables	75
		6.2.3 Non-uniform discrete random variables	76
	6.3	Expected value, variance, and standard deviation	77
		6.3.1 Expected value	77
		6.3.2 Variance and standard deviation	78
Ш	Ev	am Revision Tips	80
		ice for assessments	81
	AUV	LE IVI daaleaanienis	ΟI