Mathematics A Very Short Introduction Timothy Gowers

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Trigonometry: A Very Short Introduction Oxford University Press
The teaching and learning of mathematics has degenerated into the realm of rote memorization, the outcome of which leads to satisfactory formal ability but not real understanding or greater intellectual independence. The new edition of this classic work seeks to address this problem. Its goal is to put the meaning back into mathematics. "Lucid . . . easily understandable".--Albert Einstein. 301 linecuts.
Complexity OUP Oxford Modern statistics is very different from the dry and dusty discipline of the popular imagination. In its place is an exciting subject which uses deep theory and powerful software tools to shed light and enable understanding. And it sheds this light on all aspects of our lives, enabling astronomers to explore the origins of the universe, archaeologists to investigate ancient civilisations, governments to

understand how to benefit and improve society, and businesses to learn how best to provide goods and services. Aimed at readers with no prior mathematical knowledge, this Very Short Introduction explores and explains how statistics work, and how we can decipher them. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable. *Mathematics* OUP Oxford Number theory is the branch of mathematics that is primarily concerned with the counting numbers. Of particular importance are the prime numbers, the 'building blocks' of our number system. The subject is an old one, dating back over two millennia to the ancient Greeks, and for many years has been studied for its intrinsic beauty and elegance, not least because several of its challenges are so easy to state that everyone can understand them, and yet no-one has ever been able to resolve them. But number theory has also recently become of great practical importance - in the area of cryptography, where the security of your credit card, and indeed of the nation's defence, depends on a result concerning prime numbers that dates back to the 18th century. Recent years

have witnessed other spectacular developments, such as Andrew Wiles's proof of 'Fermat's last theorem' (unproved for over 250 years) and some exciting work on prime numbers. In this Very Short Introduction Robin Wilson introduces the main areas of classical number theory, both ancient and modern. Drawing on the work of many of the greatest mathematicians of the past, such as Euclid, Fermat, Euler, and Gauss, he situates some of the most interesting and creative problems in the area in their historical context.

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The History of Mathematics: A Very Short Introduction Oxford University Press
What is 'the void'? What remains when you take all the matter away? Can empty space - 'nothing' - exist? This text explores the science & history of the elusive void - from Aristotle's theories to black holes & quantum particles, & why our very latest discoveries about the vacuum can tell us extraordinary things about the cosmos.

Relativity: A Very Short Introduction Cambridge University Press
The aim of this volume is to explain the differences between research-level mathematics and

the maths taught at school. Most differences are philosophical and the first few chapters are about general aspects of mathematical thought.

Mathematics: A Very Short Introduction Oxford University Press

Infinity is an intriguing topic, with connections to religion, philosophy, metaphysics, logic, and physics as well as mathematics. Its history goes back to ancient times, with especially important contributions from Euclid, Aristotle, Eudoxus, and Archimedes. The infinitely large (infinite) isintimately related to the infinitely small (infinitesimal). Cosmologists consider sweeping questions about whether space and time are infinite. Philosophers and mathematicians ranging from Zeno to Russell have posed numerous paradoxes about infinity and infinitesimals. Many vital areas ofmathematics rest upon some version of infinity. The most obvious, and the first context in which major new techniques depended on formulating infinite processes, is calculus. But there are many others, for example Fourier analysis and fractals.In this Very Short Introduction, Ian Stewart discusses infinity in mathematics while also drawing in the various other aspects of infinity and explaining some of the major problems and insights arising from this concept. He argues that working with infinity is not just an abstract, intellectualexercise but that it is instead a concept with important practical everyday applications, and considers how mathematicians use infinity and infinitesimals to answer questions or supply techniques that do not appear to involve the infinite.ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, andenthusiasm to make interesting and challenging topics highly readable.

Measurement: A Very Short Introduction OUP Oxford
In the 1800s mathematicians introduced a formal theory of symmetry: group theory. Now a branch of abstract algebra, this subject first arose in the theory of equations. Symmetry is an immensely important concept in mathematics and throughout the sciences, and its applications range across the entire subject. Symmetry governs the structure of crystals, innumerable types of pattern formation, how systems change their state as parameters vary; and fundamental physics is governed by symmetries in the laws of nature. It is highly visual, with applications that include animal markings, locomotion, evolutionary biology, elastic buckling, waves, the shape of the Earth, and the form of galaxies. In this Very Short Introduction, Ian Stewart demonstrates its deep implications, and shows how it plays a major role in the current search to unify relativity and quantum theory. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.
Information: A Very Short Introduction Oxford University Press
In this very short introduction, John Holland presents an introduction to the science of

complexity. Using examples from biology and economics, he shows how complexity science models the behaviour of complex systems.

<u>Topology</u> Oxford University Press

Numbers are integral to our everyday lives and feature in everything we do. In this Very Short Introduction Peter M. Higgins, the renowned mathematics writer, unravels the world of numbers; demonstrating its richness, and providing a comprehensive view of the idea of the number. Higgins paints a picture of the number world, considering how the modern number system matured over centuries. Explaining the various number types and showing how they behave, he introduces key concepts such as integers, fractions, real numbers, and imaginary numbers. By approaching the topic in a non-technical way and emphasising the basic principles and interactions of numbers with mathematics and science, Higgins also demonstrates the practical interactions and modern applications, such as encryption of confidential data on the internet. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

<u>Number Theory: A Very Short Introduction</u> Oxford University Press

René Descartes (1596-1650) had a remarkably short working life, and his output was small, yet his contributions to philosophy

and science have endured to the present day. He is perhaps best known for his statement 'Cogito, ergo sum'. By a mixture of 'intuition' and 'deduction' Descartes derived from the 'cogito' principle first the existence of a material world. But Descartes did not intend the metaphysics to stand apart from his scientific work, which included important investigations into physics, mathematics, psychology, and optics. In this book Tom Sorrell shows that Descartes was, above all, an advocate and practitioner of a new mathematical approach to physics, and that he developed his metaphysics to support his programme in the sciences. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Infinity Oxford University Press, USA

Quantum Theory is the most revolutionary discovery in physics since Newton. This book gives a lucid, exciting, and accessible account of the surprising and counterintuitive ideas that shape our understanding of the sub-atomic world. It does not disguise the problems of interpretation that still remain unsettled 75 years after the initial discoveries. The main text makes no use of equations, but there is a Mathematical Appendix for those desiring stronger fare. Uncertainty, probabilistic physics, complementarity, the problematic character of measurement, and decoherence are among the many topics discussed. ABOUT THE

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Numbers: A Very Short Introduction Oxford University Press

Now a vital part of modern economies, the rapid growth of the finance industry in recent decades is largely due to the development of mathematical methods such as the theory of arbitrage. Asset valuation, credit trading, and fund management, now depend on these mathematical tools. Mark Davis explains the theories and their applications.

An Introduction to the Philosophy of Mathematics

Oxford University Press, USA

Every atom of our bodies has been part of a star. Our very own star, the Sun, is crucial to the development and sustainability of life on Earth. This Very Short Introduction presents a modern, authoritative examination of how stars live, producing all the chemical elements beyond helium, and how they die, sometimes spectacularly, to end as remnants such as black holes. Andrew King shows how understanding the stars is key to understanding the galaxies they inhabit, and thus the history of our entire Universe, as well as the existence of planets like our own. King presents a fascinating exploration of the science of stars, from the mechanisms that allow stars to form and the processes that allow them to shine, as well as the results of their inevitable death. ABOUT THE SERIES: The Very Short Introductions

series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Newton Oxford University Press Chaos exists in systems all around us. Even the simplest system of cause and effect can be subject to chaos, denying us accurate predictions of its behaviour, and sometimes giving rise to astonishing structures of large-scale order. Our growing understanding of Chaos Theory is having fascinating applications in the real world - from technology to global warming, politics, human behaviour, and even gambling on the stock market. Leonard Smith shows that we all have an intuitive understanding of chaotic systems. He uses accessible maths and physics (replacing complex equations with simple examples like pendulums, railway lines, and tossing coins) to explain the theory, and points to numerous examples in philosophy and literature (Edgar Allen Poe, Chang-Tzu, Arthur Conan Doyle) that illuminate the problems. The beauty of fractal patterns and their relation to chaos, as well as the history of chaos, and its uses in the real world and implications for the philosophy of science are all discussed in this Very Short Introduction. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Algebra Oxford University Press, USA

Newton's contributions to an understanding of the heavens

and the earth are considered to be unparalleled. This very short introduction explains his scientific theories, and uses Newton's unpublished writings to paint a picture of an extremely complex man whose beliefs had a huge impact on Europe's political, intellectual, and religious landscape.

Applied Mathematics Oxford University Press

Physics, the fundamental science of matter and energy, encompasses all levels of nature from the subatomic to the cosmic, and underlies much of the technology around us. Understanding the physics of our universe is an essential aspect of humanity's quest to understand our environment and our place within it. Doing physics enables us to explore the interaction between environment and human society, and can help us to work towards the future sustainability of the planet. This Very Short Introduction provides an overview of how this pervasive science came to be and how it works: who funds it, how physicists are trained and how they think, and how physics supports the technology we all use. Sidney Perkowitz presents the theories and outcomes of pure and applied physics from ideas of the Greek natural philosophers to modern quantum mechanics, cosmology, digital electronics and energy production. Considering its most consequential experiments, including recent results in elementary particles, gravitational waves and materials science, he also discusses outside the lab, the effects of physics on society, culture, and humanity's vision of its place in the universe. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Applied Mathematics: A Very Short Introduction OUP

Oxford

Mathematics is a fundamental human activity that can be practised and understood in a multitude of ways; indeed, mathematical ideas themselves are far from being fixed, but are adapted and changed by their passage across periods and cultures. In this Very Short Introduction, Jacqueline Stedall explores the rich historical and cultural diversity of mathematical endeavour from the distant past to the present day. Arranged thematically, to exemplify the varied contexts in which people have learned, used, and handed on mathematics, she also includes illustrative case studies drawn from a range of times and places, including early imperial China, the medieval Islamic world, and nineteenth-century Britain. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Descartes: A Very Short Introduction Oxford Paperbacks

The study of geometry is at least 2500 years old, and it is within this field that the concept of mathematical proof - deductive reasoning from a set of axioms - first arose. To this day geometry remains a very active area of research in mathematics. This Very Short Introduction covers the areas of mathematics falling under geometry, starting with topics such as Euclidean and

non-Euclidean geometries, and ranging to curved spaces, projective geometry in Renaissance art, and geometry of space-time inside a black hole. Starting from the basics, Maciej Dunajski proceeds from concrete examples (of mathematical objects like Platonic solids, or theorems like the Pythagorean theorem) to general principles. Throughout, he outlines the role geometry plays in the broader context of science and art. Very Short Introductions: Brilliant, Sharp, Inspiring ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Logic: A Very Short Introduction Oxford University Press

How is a subway map different from other maps? What makes a knot knotted? What makes the Möbius strip one-sided? These are questions of topology, the mathematical study of properties preserved by twisting or stretching objects. In the 20th century topology became as broad and fundamental as algebra and geometry, with important implications for science, especially physics. In this Very Short Introduction Richard Earl gives a sense of the more visual elements of topology (looking at surfaces) as well as covering the formal definition of continuity. Considering some of the eye-opening examples that led mathematicians to recognize a need for studying topology, he pays homage to the historical people, problems, and surprises that have propelled the growth of

this field. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Chaos: A Very Short Introduction Oxford University Press, USA 100 years ago, Einstein's theory of relativity shattered the world of physics. Our comforting Newtonian ideas of space and time were replaced by bizarre and counterintuitive conclusions: if you move at high speed, time slows down, space squashes up and you get heavier; travel fast enough and you could weigh as much as a jumbo jet, be squashed thinner than a CD without feeling a thing - and live for ever. And that was just the Special Theory. With the General Theory came even stranger ideas of curved space-time, and changed our understanding of gravity and the cosmos. This authoritative and entertaining Very Short Introduction makes the theory of relativity accessible and understandable. Using very little mathematics, Russell Stannard explains the important concepts of relativity, from E=mc2 to black holes, and explores the theory's impact on science and on our understanding of the universe. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.