DISCOVERING MATHEMATICS

The Mastery Course for Key Stage 3

Bringing together an experienced team of UK reviewers and mastery experts, alongside the original Singaporean author team, this is the UK adaptation of the leading Singapore course.

Discover more:
www.oxfordsecondary.co.uk/discoveringmathematics
**NEW**

**KS3 maths mastery from Oxford**

*Discovering Mathematics* is the exciting new maths course from Oxford that brings the renowned Singaporean secondary series to the English Key Stage 3 National Curriculum.

- Adapted by the original Singaporean author team in conjunction with a large team of UK mastery experts and teachers
- Includes new material written to provide comprehensive support for three tiers (Foundation, Middle and Higher) across all three year groups
- Draws upon a proven approach to raising maths achievement, built around the ‘growth mindset’ that every child can succeed
- Enables students to explore new concepts through concrete, pictorial and abstract representation, supporting progression and depth of understanding
- Applies new 9-1 GCSE grades to every question (visible to teachers only), for tracking progression
- Supported by digital resources through the popular Kerboodle platform
- Optional professional development training is available to provide full support in implementing the course.

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This chart outlines the course structure for *Discovering Mathematics*:

### Phase 1 (Year 7)

**Graded Question Banks**

- Graded Question Bank 1 (Summer 2018)
  - 978 019 842326

- Graded Question Bank 2 (Summer 2019)
  - 978 019 8423297

### Phase 2 (Year 8)

**Graded Question Banks**

- Graded Question Bank 3 (Summer 2018)
  - 978 019 8423230

### Phase 3 (Year 9)

**Graded Question Banks**

- Graded Question Bank 4 (Summer 2019)
  - 978 019 8423244

**Kerboodle Books**

- Kerboodle Books
  - Contains all digital resources

**Manipulatives**

- Discovering Mathematics Manipulatives Pack: Algebra Dice (Summer 2018)
  - 978 019 842387 0

- Discovering Mathematics Manipulatives Pack: Algebra Books (Summer 2019)
  - 978 019 842393 3

- Discovering Mathematics Manipulatives Pack: Algebra Books
  - 978 019 842392 1

**Teacher Guides**

- Kerboodle Books
  - Contains all Kerboodle

**Student Books**

- Student Book 1A (Summer 2018)
  - 978 019 842172 6

- Student Book 1B (Summer 2018)
  - 978 019 842177 1

- Student Book 1C (Summer 2018)
  - 978 019 842174 0

- Student Book 2A (Summer 2019)
  - 978 019 842180 1

- Student Book 2B (Summer 2019)
  - 978 019 842184 9

- Student Book 2C (Summer 2019)
  - 978 019 842195 5

- Student Book 3A (Summer 2019)
  - 978 019 842192 4

- Student Book 3B (Summer 2019)
  - 978 019 842192 4

- Student Book 3C (Summer 2019)
  - 978 019 842216 7

**Teacher Guides**

- Teacher Guide 1A (Summer 2018)
  - 978 019 842322 4

- Teacher Guide 1B (Summer 2018)
  - 978 019 842320 0

- Teacher Guide 1C (Summer 2018)
  - 978 019 842320 4

- Teacher Guide 2A (Summer 2019)
  - 978 019 842324 4

- Teacher Guide 2B (Summer 2019)
  - 978 019 842324 7

- Teacher Guide 2C (Summer 2019)
  - 978 019 842324 1

- Teacher Guide 3A (Summer 2019)
  - 978 019 842320 4

- Teacher Guide 3B (Summer 2019)
  - 978 019 842320 4

- Teacher Guide 3C (Summer 2019)
  - 978 019 842320 4
Introducing the team

The UK adaptation of Discovering Mathematics has been developed by the original Singaporean author team, in conjunction with a large team of UK and Singaporean teacher reviewers and mastery practitioners. These include:

**Author** Victor Chow has over 16 years’ experience of teaching in secondary schools and technical institutes. Passionate about textbooks, he is the author of a number of successful mathematics and statistics series for students in Years 7 to 12. Writing under the name Chow Wai Keung, he is the author of the original Discovering Mathematics series, which has been the leading course in Singapore for the last 10 years.

**Singapore Consultant** Berinderjeet Kaur is Professor of Mathematics Education at the National Institute of Education in Singapore. She is the founding chairperson of the Singaporean Mathematics Teachers’ Conference series and a member of the Mathematics Expert Group to PISA 2015. She is passionate about the development of mathematics teachers. Professor Kaur has been a key consultant and reviewer for the UK adaptation of Discovering Mathematics and its Professional Development programme.

See page 15 for more details on the Discovering Mathematics Professional Development Programme

**UK Consultant** Robert Wilne has over 20 years’ experience teaching both primary and secondary maths, most recently teaching at the Harris Federation, where he was focusing on ‘joining up’ learning and teaching of maths from Y5 to Y8. He previously led the England-Shanghai Teaching for Mastery teacher exchange and research project at the National Centre for Excellence in the Teaching of Mathematics (of which he was Director for Secondary).

**Star Publishing Pte Ltd**

Discovering Mathematics is created in partnership with Star Publishing, a well-known Singapore-based educational publisher led by Steve Seow, whose experience and expertise in educational publishing has been widely respected since the 1970s.

Series Guide for Teachers

Berinderjeet Kaur, Robert Wilne and Naomi Norman

This easy-to-read guide offers an overview of the mastery approach and how it can be implemented in your school.

- Jargon-free explanations that uncover the secrets of Singapore’s extraordinary maths success
- Introduces and explains the key principles of teaching for mastery
- Illustrated examples and case studies offer practical tips on how to successfully introduce the approach into your maths department
- Key features of the Discovering Mathematics series are explained, with advice on how to make the best use of all components in the series, including the Kerboodle digital resources.

Discovering Mathematics: Series Guide for Teachers

978 019 8422225 9

**What’s so special about the mastery approach?**

In the top performing Asian nations, considerable emphasis is placed on teachers’ professional development and on using high quality resources. In Singapore, for example, all secondary schools adopt a textbook series and over 60% of them have chosen Discovering Mathematics.

The mastery approach is broadly characterised by:

- the use of *concrete objects and pictures*, alongside *abstract representation*, to explain concepts
- a focus on *problem-solving* as the ultimate objective of a maths education
- a commitment to all students mastering a concept before moving on – underpinned by the firm belief that all students can succeed
- Precise use of mathematical language at all times and in all answers
- Consistent use of models and concrete objects, in particular bar models, place-value discs, and algebra discs.

Order your Evaluation Pack today!

*Discovering Mathematics* Evaluation Pack

978 019 842671 4

Evaluates free for 30 days! See back page for details of how to request your copy.

**Pack contains:**

- Student Book 1B (Middle Tier, Year 7)
- Workbook 1B (Middle Tier, Year 7)
- Course Guide
- Sample chapter from Student Book 2B (Middle Tier, Year 7)

See page 15 for more details on the Professional Development programme.
The Discovering Mathematics Student Books pioneered the discovery approach to learning. Core learning is interspersed with class activities, which encourage group learning and discussion, and short Try It! questions to ensure understanding every step of the way. Concrete and pictorial activities help to build a truly rich, deep understanding of the maths. Above all, the whole class is encouraged to progress together. Problem-solving questions are clearly flagged and provide the final support on the road to mastery.

**INTRODUCTION TO ALGEBRA**

Many sets and figures serve to illustrate important points. For example, the number of wheels on bicycles is related to the number of bicycles. How does this work? What is in this expression?

**LETS LEARN TO**

1. **Addition and subtraction from left to right**
2. **Multiplication**
3. **Division**

**Student Books**

- **Short films in Kerboodle** accompany each chapter opener, introducing topics in a real-world context.
- **Flashbacks** in Year 7 resources remind students of their learning in KS2, to aid transition to secondary school.
- **Contexts localised to the UK as part of the adaptation**
- **Learning objectives** are clearly defined at the start of every chapter.
- **Algebra discs** are used as concrete manipulatives to develop deep understanding.
- **Remark boxes** provide hints and expose common misconceptions.
- **Example, Solution, and Try It! sections** are designed to develop and secure progression in micro steps.
- **In a Nutshell** sections summarise the key learning points in each chapter to support revision.
- **Careful variation** of numbers and concepts throughout reinforces and deepens learning.

**EXERCISE 3.5**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(a) (6 - 5) = 1$</td>
<td>$(b) (7 - 8) = -1$</td>
</tr>
<tr>
<td>$(c) 7 \times 2 = 14$</td>
<td>$(d) 5 \div 2 = 2.5$</td>
</tr>
</tbody>
</table>

**Concrete and pictorial activities**

Try It!

- **Encourage group learning and discussion**
- **Short approach**

**Discovering Mathematics**

**Student Books**
Integrated Examples and Review Exercises occur after each group of chapters in the Student Books. Step-by-step solutions show students how to work through a given example. Short Try It! questions build on that learning so students feel confident to attempt subsequent Review Exercises.

Financial and Science sections consolidate students’ connections with mathematical ideas across other subjects.

Revision Exercises at the end of each chapter assess understanding. Auto-marked tests on Kerboodle also give instant feedback to allow for rapid intervention (see pages 12-13).

Problem-solving questions are clearly flagged throughout the course.

Two problem-solving sections are included in every Student Book:
- **Problem-Solving and Heuristics** teaches students how to plan and approach a problem-solving task
- **Problems in Real-World Contexts** at the end of each Student Book gives students the chance to apply their learning to real-life examples.

Easily accessible Student Book answers:
We know it’s important for you and your students to have easy access to the answers for the Student Book questions, so we have provided three options for you.

1. **Short answers** in the back of the Student Books
2. **Fully worked solutions** in the Teacher Guide, with GCSE 9-1 grades indicated
3. **Try It! videos** as hotspots in the digital book on Kerboodle show a narrated stepped reveal of key examples. These support students to develop reasoning and to use precise mathematical language.
David thinks 1.

Tim is three years older than John. Find Tim’s age if John is 30 years old.

Write an algebraic expression for each statement.

4.

5.

Simplify these expressions.

Add 6

Multiply 4

Divide 9

There are 2 identical model cars on a shelf. Find the length of each car if there are 30 cars.

Mrs Turner used a £10 note and some £2 coins to pay at a counter. How much did she pay if there are £5 notes and seven £10 notes, £50 notes.

State the number of terms and the constant term, if any, in each of these expressions.

The total of 9 and 5

The total number of balls in the set is 90 kg.

Find, in terms of C in K.

Betty burns calories when she walks for 1 minute. How many calories will be burned if she walks for 12 minutes, find the value of

H 5 and

= 5,

= 6(4 - 3), find the value of

1. Short answers FREE for customers to download ONLINE (password-protected)
2. Fully worked solutions with GCSE grades on Kerboodle (teacher-only access)

Graded Question Banks

These supplementary practice resources are for use alongside the Student Books and Workbooks. There is one book for each year, with questions following the series approach of three levels, with clear identification of problem-solving and cross-curricular questions.

Graded Question Bank answers provided in two easily-accessible formats:
1. Short answers at the back of the book
2. Fully worked solutions on Kerboodle (teacher-only access)

Pages from Graded Question Bank 1 (Year 7)

Concrete manipulatives to help students master algebra are available in class-sets colour-coded to match the Student Books.

Discovering Mathematics Manipulatives Pack: Algebra Discs

1. To support activities in Higher, Middle and Foundation Tiers
2. For operations using positive and negative integers
3. For understanding of algebraic expressions and operations
4. Class set contains 20 Student Sets for sharing in class (1,600 discs in total)
5. Each Student Set includes 80 two-sided positive/negative discs of 5 different colours
6. All discs are double-sided

1/1 - $/x - y/-y - x/-x^2 - y/-y^2
Introduction to Algebra

Most cars and lorries carry a spare tyre. Cars have 4 working tyres + 1 spare tyre, so 5 tyres in total. Some lorries have 8 working tyres as well as the spare tyre. All these vehicles can be said to carry ‘N + 1 tyres’.

What does N stand for in this expression?

\[ N + 1 \]

Let’s learn to:

- Use letters to represent integers
- Interpret simple algebraic notations
- Substitute integers into simple expressions and formulae
- Write simple expressions and formulae
- Simplify expressions by collecting like terms
- Add and subtract linear expressions
- Auto-marked tests for every chapter give you and your students instant feedback, allowing for rapid intervention and support
- Links to corresponding MyMaths lessons for each chapter section, providing further practice and support for your students
- Worked example videos of key Try It! questions provide a line-by-line walk-through of questions with model answers
- Chapter-opening videos introduce every topic in a real-life context
- Online resources

Discovering Mathematics Kerboodle provides complete support for digital practice and assessment. It includes:

- Digital editions of all nine Student Books for front-of-class use, with hotspots on the page linking directly to videos, assessments, and further support on MyMaths
- Full suite of printable assessments offer progression from basic fluency, to application of concepts, to problem-solving
- Auto-marked tests for each chapter give you and your students instant feedback, allowing for rapid intervention
- Printable self-assessment checklist for students to track their own progression
- Fully worked solutions to all questions in the Workbooks, Graded Question Banks and printable assessments show students how to reason and present their answers using precise mathematical language
- Unique worked example videos for key Try It! questions facilitate working through solutions in the classroom
- Digital edition of the Series Guide for Teachers offers an easy-to-read overview of how Discovering Mathematics works and how to embed it successfully in your school

Also available

Discovering Mathematics Kerboodle Books provides online student access to all nine Student Books for use in school or at home.
1. Look at the values under the columns 3

2. You say that (3 = 3(3

3. The number 14 stands for the hourly wage

4. The freezing point of water is 32 F.

5. Express

6. Planning for successful implementation and dissemination

7. Introduction to Discovering Mathematics

8. Developing pedagogical understanding of the Singaporean approach to teaching and learning mathematics

9. Theory and research models

10. Effective use of manipulatives

11. Audit and evaluation of impact

12. SLT ONLY

13. Head of Department (Maths)

14. Head of KS3

15. Teacher of mathematics KS3

16. Maths Specialists/ non specialists

17. Educators interested in teaching for mastery at secondary level

18. Head of Department (Maths)

19. Head of KS3

20. Teacher of mathematics KS3

21. NQTs (Maths)

22. Maths Specialists/ non specialists

23. Educators interested in teaching for mastery at secondary level

24. An Introduction to Discovering Mathematics

25. Launching January 2018

26. 5 hours

27. 3 days over 3 terms

28. 15 hours

29. Implementation Programme – Train the Trainer

30. Launching Summer 2018

31. InSET or Central Training

32. 5 hours

33. 3 days over 3 terms

34. 15 hours

35. Implementation Programme – InSET x 3

36. Launching Summer 2018

37. 5 hours

38. Online option: Webinars for Development Modules

39. 1.5 hours

40. Review of implementation to date

41. Planning next steps

42. Bespoke content

43. £150 Webinar
Discover more Order your Evaluation Pack today!

*Discovering Mathematics Evaluation Pack
978 019 842671 4
Available on 30 day free evaluation.
For our terms and conditions visit our website.

**Publishing timeline***

- **January 2018**: Evaluation Pack available, containing Year 7 Student Book 1B and Workbook 1B
- **January 2018**: Kerboodle ‘Early Access’ resources available for evaluation
- **By Summer 2018**: All other Year 7 resources available
- **By Summer 2019**: All Year 8 and 9 resources available

*Publication dates may be subject to change

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**Contact us**

**To request your Evaluation Pack or to place an order:**

- **Email**: schools.orders.uk@oup.com
- **Call**: 01536 452620
- **Web**: www.oxfordsecondary.co.uk/discoveringmathematics

**Get support or register for a free Kerboodle trial**

Email secondary.enquiries@oup.com or contact your local educational consultant:
www.oxfordsecondary.co.uk/repfinder

**Enquire about Professional Development**

Contact Oxford’s Professional Development team:
- **Email**: discoveringmathematicsspd@oup.com
- **Call**: 01865 353070

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