

# Mathematics

Syllabus outlines

For examination from 2012–2015

Cambridge  
**Pre-U**

Mathematics

Further Mathematics

Mathematics (Statistics with  
Pure Mathematics) Short Course

Further Mathematics Short Course



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Cambridge Pre-U is available in 28 subjects:

Art and Design	History
Art History	Italian
Biology	Latin
Business and Management	Literature in English
Chemistry	Mandarin Chinese
Classical Greek	Mathematics*
Classical Heritage	Music
Comparative Government and Politics	Philosophy and Theology
Drama and Theatre	Physics
Economics	Psychology
French*	Russian*
Further Mathematics*	Spanish*
Geography	Sports Science
German*	
Global Perspectives and Research	

*\*a one-year certified Short Course is also available.*

### Feedback from schools



- Increased focus and motivation in year 12 pupils
- Richer, more coherent educational experience
- Encourages wider reading
- More independent inquiry and learning
- Opportunity to develop and pursue own academic interests
- Greater scope for upper ability pupils to distinguish themselves
- More time and support available for lower ability pupils
- Greater maturity at examination time



## Cambridge Pre-U overview

Cambridge Pre-U is an exciting qualification for 16–19 year olds who want to go to university. It equips students with the knowledge and skills they need to make a success of their undergraduate studies:

- a solid and coherent grounding in specialist subjects at an appropriate level
- the ability to undertake independent and self-directed learning
- the ability to think laterally, critically and creatively and communicate effectively

Cambridge Pre-U Principal Subjects and Short Courses are stand-alone qualifications, recognised by universities and attracting a rewarding UCAS tariff. They are compatible with A Levels and may be taken in combination with them.

For Cambridge Pre-U Principal Subjects, students take all examination components at the end of a two-year programme of study, and we assess them at the full Cambridge Pre-U standard.

For Cambridge Pre-U Short Courses, students take all examination components at the end of a one-year programme of study. A Short Course grade does not contribute to a Principal Subject result. In this sense, a distinctive feature of Cambridge Pre-U is linearity.

### Common characteristics of Cambridge Pre-U syllabuses

- **Design:** focused on the development of high-level knowledge, understanding and skills to prepare for university and beyond, through extensive consultation with teachers, students and universities.
- **Stretch:** built into syllabus content (380 guided learning hours and challenging concepts), assessment (open-ended questions) and grading outcomes (finer differentiation at the top end).
- **Innovation:** new approaches to subjects, greater freedom in subject combination, new topics, new methods of delivery and new forms of assessment.
- **Progression in learning:** Cambridge Pre-U builds on prior knowledge gained at 14–16, where appropriate, and develops broad generic skills (independent study and research skills). Students are better prepared for undergraduate study.
- **Linearity:** assessment at the end of the course makes for greater coherence in teaching and learning.



# Cambridge Pre-U Mathematics and Further Mathematics Principal Subjects

Cambridge Pre-U Mathematics and Further Mathematics give students an excellent foundation for using mathematics in higher education courses or other career pathways. They lead students to acquire skills they can apply in a wide range of contexts.

We have designed Cambridge Pre-U Mathematics and Further Mathematics to encourage teaching and learning which enable students to develop a positive attitude towards the subject. The courses develop an understanding of mathematics and mathematical processes in a way that promotes confidence and enjoyment.

## Curriculum

In both courses, students are expected to develop parallel strands of mathematics – Pure Mathematics and Applications of Mathematics – and we encourage them to understand how the different branches of mathematics interconnect. We ask students to apply their mathematical knowledge in the contexts of both Mechanics and Probability, and we present them with less familiar scenarios.

Cambridge Pre-U Mathematics and Further Mathematics enable students to:

- develop a range of mathematical skills and techniques, appreciating their applications in a wide range of contexts, and to apply these techniques to problem solving in familiar and less familiar contexts.
- develop an understanding of how different branches of mathematics are connected.
- recognise how a situation may be represented mathematically and understand how mathematical models can be refined.
- use mathematics as an effective means of communication, through the use of correct mathematical language and notation and through the construction of sustained logical arguments, including an appreciation of the limitations of calculator use in relation to obtaining exact solutions.



## Cambridge Pre-U Mathematics Principal Subject syllabus

<b>Paper 1 and Paper 2</b>	<b>Pure Mathematics</b> Quadratics Algebra Functions Coordinate geometry Circular measure Trigonometry Sequences and series Logarithms and exponentials Differentiation Integration Vector geometry Differential equations Complex numbers Numerical methods	<b>Paper 3</b>	<b>Probability</b> Analysis of data Probability laws Permutations and combinations Discrete random variables The normal distribution  <b>Mechanics</b> Kinematics of motion in a straight line Force and equilibrium Friction Newton's laws of motion Linear momentum and impulse Motion of a projectile
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## Scheme of assessment

Candidates taking the Cambridge Pre-U Principal Subject qualification in Mathematics take all three papers together in the same session.

Component	Component title	Duration	Weighting	Type of assessment
Paper 1	Pure Mathematics 1	2 hours	33 $\frac{1}{3}$ %	Written paper, externally set and marked
Paper 2	Pure Mathematics 2	2 hours	33 $\frac{1}{3}$ %	Written paper, externally set and marked
Paper 3	Application of Mathematics	2 hours	33 $\frac{1}{3}$ %	Written paper, externally set and marked

## Cambridge Pre-U Further Mathematics Principal Subject syllabus

<b>Paper 1</b>	<b>Pure Mathematics</b> Rational functions Roots of polynomials Complex numbers De Moivre's theorem Polar coordinates Summation of series Mathematical induction Calculus Hyperbolic functions Differential equations Vector geometry Matrices Groups	<b>Paper 2</b>	<b>Mechanics</b> Energy, work and power Motion in a circle Relative motion Elastic strings and springs Simple harmonic motion Further particle dynamics Linear motion under a variable force  <b>Probability</b> Poisson distribution Normal distribution as approximation Continuous random variables Linear combinations of random variables Estimation Probability generating functions Moment generating functions
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## Scheme of assessment

Candidates taking the Cambridge Pre-U Principal Subject qualification in Further Mathematics take both papers together in the same session.

Component	Component Title	Duration	Weighting	Type of assessment
Paper 1	Further Pure Mathematics	3 hours	50%	Written paper, externally set and marked
Paper 2	Further Applications of Mathematics	3 hours	50%	Written paper, externally set and marked



“ The main difference that I have found in learning is that I get a lot more enthusiasm from my Cambridge Pre-U class and I think that is largely to do with the fact that they know that they don't have an exam just around the corner... they are more open to asking more explorative questions. ”

James Stewart Cox,  
Mathematics Teacher, Norton Hill School

# Cambridge Pre-U Mathematics (Statistics with Pure Mathematics) Short Course

Cambridge Pre-U Short Courses allow students to broaden their learning beyond their major subject specialisms. They are one-year courses (180 guided learning hours), designed to follow GCSE or IGCSE.

Understanding mathematical concepts is vital for success on many degree courses. That's why we have consulted closely with teachers and universities about a new mathematics course to support students studying other subjects, such as biology, chemistry, economics, geography and business. It will help students applying for university by showing they can deal confidently with the mathematical concepts that complement their chosen degree course.

## Curriculum

Cambridge Pre-U Mathematics Short Course enables students to:

- develop a range of mathematical skills and techniques, appreciating their applications in a wide range of contexts, and to apply these techniques to problem solving in familiar and less familiar contexts.
- recognise how a situation may be represented mathematically.
- use mathematics as an effective means of communication, through the use of correct mathematical language and notation to support other subjects.





## Syllabus

<b>Paper 1</b>	<b>Pure Mathematics</b> Quadratics Coordinate geometry Sequences and series Logarithms and exponentials Differentiation Integration	<b>Paper 2</b>	<b>Statistics</b> Analysis of data The binomial distribution The normal distribution Sampling and hypothesis tests Confidence intervals: the $t$ distribution $\chi^2$ tests Non-parametric tests
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## Scheme of assessment

Candidates taking the Cambridge Pre-U Short Course qualification in Mathematics take both papers together in the same session.

Component	Component title	Duration	Weighting	Type of assessment
Paper 1	Pure Mathematics	1 hour 45 mins	45%	Written paper, externally set and marked
Paper 2	Statistics	2 hours	55%	Written paper, externally set and marked

“ This is a good preparation for the mathematical and statistical aspects of degrees in Biology, Zoology, Genetics etc. ”  
 University of Nottingham

# Cambridge Pre-U Further Mathematics Short Course\*

Cambridge Pre-U Further Mathematics Short Course is for students who wish to extend their studies beyond the Mathematics Principal Subject but not as far as the Further Mathematics Principal Subject – in a similar way to students who take A Level Mathematics and AS Level Further Mathematics.

It gives students a solid grounding in pure mathematics which will benefit them in university study of other subjects such as engineering.

## Curriculum

Cambridge Pre-U Further Mathematics Short Course focuses on the Pure Mathematics topics of the Cambridge Pre-U Further Mathematics Principal Subject syllabus and enables students to:

- develop a range of mathematical skills and techniques, appreciating their applications in a wide range of contexts, and to apply these techniques to less familiar contexts.
- recognise how a situation may be represented mathematically and understand how mathematical models can be refined.
- use mathematics as an effective means of communication, through the use of correct mathematical language and notation and through the construction of sustained logical arguments, including an appreciation of the limitations of calculator use in relation to obtaining exact solutions.



\* Draft syllabus submitted to Ofqual at time of writing (May 2011).

## Syllabus

<b>Paper 1</b>	<b>Further Pure Mathematics</b> Rational functions Roots of polynomials Complex numbers De Moivre's theorem Polar coordinates Summation of series	Mathematical induction Calculus Hyperbolic functions Differential equations Vector geometry Matrices Groups
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## Scheme of assessment

Component	Component title	Duration	Type of assessment
Paper 1	Further Pure Mathematics	3 hours	Written paper, externally set and marked



## Reporting of achievement

Achievement is reported on a scale of nine grades: Distinction 1, 2 and 3, Merit 1, 2 and 3 and Pass 1, 2 and 3. The Distinction 3 standard is aligned to that of Grade A and the Pass 3 is aligned to that of Grade E at A Level. Distinction 1 reports achievement above the new A\* grade. The intention is to differentiate more finely and extend reporting at the top end, while keeping the grading scale accessible to the full range of ability currently achieving passes at A Level.

## UCAS tariff points

The table shows the UCAS tariff awarded to each Cambridge Pre-U Principal Subject grade and how this compares with the tariff for A Level.

The tariff reflects the additional content within each syllabus and the linear assessment (terminal examinations at full Cambridge Pre-U standard).

Universities which normally ask for three A grades at A Level typically make Cambridge Pre-U offers involving a combination of Distinction 3 and Merit 1. Other offers may include asking for a Merit 2 in place of a B, Merit 3 or Pass 1 for a C, Pass 2 for a D and Pass 3 for an E.

Cambridge Pre-U band	Cambridge Pre-U grade	Cambridge Pre-U Principal Subject UCAS tariff	Equivalent A Level UCAS tariff	Short Course UCAS tariff
Distinction	D1	tbc	n/a	tbc
	D2	145	(A*) 140	tbc
	D3	130	(A) 120	60
Merit	M1	115		53
	M2	101	(B) 100	46
	M3	87		39
Pass	P1	73		32
	P2	59		26
	P3	46	(E) 40	20

Cambridge Pre-U is recognised by all UK universities and many universities abroad, including all US Ivy League universities. For more details, please go to [www.cie.org.uk/qualifications/recognition](http://www.cie.org.uk/qualifications/recognition).

## Support and resources for teachers

We offer a programme of free Cambridge Pre-U INSET training for teachers accompanied by online support materials including syllabuses, specimen/past papers, mark schemes and example candidate responses.

A free Teacher Guide expands on each syllabus, to help teachers understand what students are expected to know.

It is written by a teacher for teachers and suggests for each topic:

- a checklist of what to cover with students
- resources, both paper and web based
- additional extension/'stretch and challenge' areas
- further teaching and learning opportunities.

**Learn more!** For more information on Cambridge Pre-U visit [www.cie.org.uk/cambridgepreu](http://www.cie.org.uk/cambridgepreu) or contact Customer Services on +44 (0)1223 553554 or email [international@cie.org.uk](mailto:international@cie.org.uk)

