

Further Mathematics Support Programme



www.furthermaths.org.uk

the **Further Mathematics** Support Programme

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Mathematics at AS and A level – what is covered and why it matters

Funded by

Department for
Education



Mathematics in Education and Industry

About the Further Mathematics Support Programme (FMSP)



- ❑ Following a successful pilot, the Further Mathematics Network was established in 2005 to ensure that all students who could benefit from it had access to Further Mathematics.
- ❑ The FMSP followed on from the Further Mathematics Network in 2009 and is also managed by MEI.
- ❑ The FMSP works with schools, colleges and universities to ensure that all students who could benefit from studying FM have the opportunity to do so.

University Involvement



The following universities work closely with the FMSP:

Bath, **Birmingham**, Cambridge, **Derby**, Durham, **Essex**, Exeter, **Imperial College**, Lancaster, **Leeds**, Leicester, **Liverpool**, Loughborough, **Keele**, Kingston, **Manchester**, Newcastle, **Nottingham**, Oxford, **Plymouth**, Royal Holloway, **Southampton**, Surrey, **Sussex**, UCL, **UEA**, UWE, **Warwick**, Wolverhampton.

This session



- ❑ Content of AS/A2 level Mathematics and Further Mathematics
- ❑ The work of the FMSP to promote and support Mathematics and Further Mathematics
- ❑ The impact on the uptake of Mathematics and Further Mathematics
- ❑ University admissions for Mathematics degrees

Pure Mathematics content of AS level Mathematics



Those who have studied AS Mathematics only will have covered

Quadratics

Surds/Indices/Logs

Equations of lines and circles

Binomial expansion (positive integer powers)

Calculus with polynomials

sine rule, cosine rule, radians

Basic sequences

Arithmetic/geometric series

Pure Mathematics content of A2 level Mathematics



Those who have also studied A2 Mathematics
(over 80,000 per year) will have covered

Vectors (scalar product/equations of lines)
Exponential function
Trigonometric identities
Differentiation of trig functions, \ln and \exp
Chain rule, product/quotient rule
Integration by substitution/parts
Generalised binomial theorem
Parametric equations

Pure Mathematics content of AS level Further Mathematics



Those who have studied AS Further Mathematics will usually have met

Complex Numbers

Matrices (2×2)

More advanced work with series

More advanced algebraic techniques

More advanced work with graphs

Proof by induction

Pure Mathematics content of A2 level Further Mathematics



Those who have studied A2 Further Mathematics (over 12,000 students per year) are likely to have met most of:

Complex exponents

3 x 3 matrices, eigenvalues/vectors

Hyperbolic trig functions

‘Harder’ integration

Vector product and applications

Taylor series and applications

Differential equations

The benefits of studying Further Mathematics



Students who have studied Further Mathematics

- ❑ have a greater understanding of mathematics as more than ‘just a process’
- ❑ are able to see connections in mathematics more easily
- ❑ are better able to tackle multistep and unstructured problems
- ❑ have greater fluency and confidence in mathematics
- ❑ are able to deal with more sophisticated notation.

The benefits of studying Further Mathematics



- ❑ Within Further Mathematics there is much more scope for studying applied mathematics.
- ❑ Students taking Further Mathematics are much more likely to take Mechanics 2 and higher modules.
- ❑ Ofqual report, 'International Comparisons in Senior Secondary Assessment', published on 11th May states that

'A level Further Mathematics was the broadest and the deepest qualification reviewed.'

What does the FMSP do?



- ❑ Promotes the study of AS/A level Mathematics and Further Mathematics
- ❑ Ensures all students can access tuition for AS/A level Further Mathematics
- ❑ Supports schools and colleges to teach AS/A level Further Mathematics

What does the FMSP do?

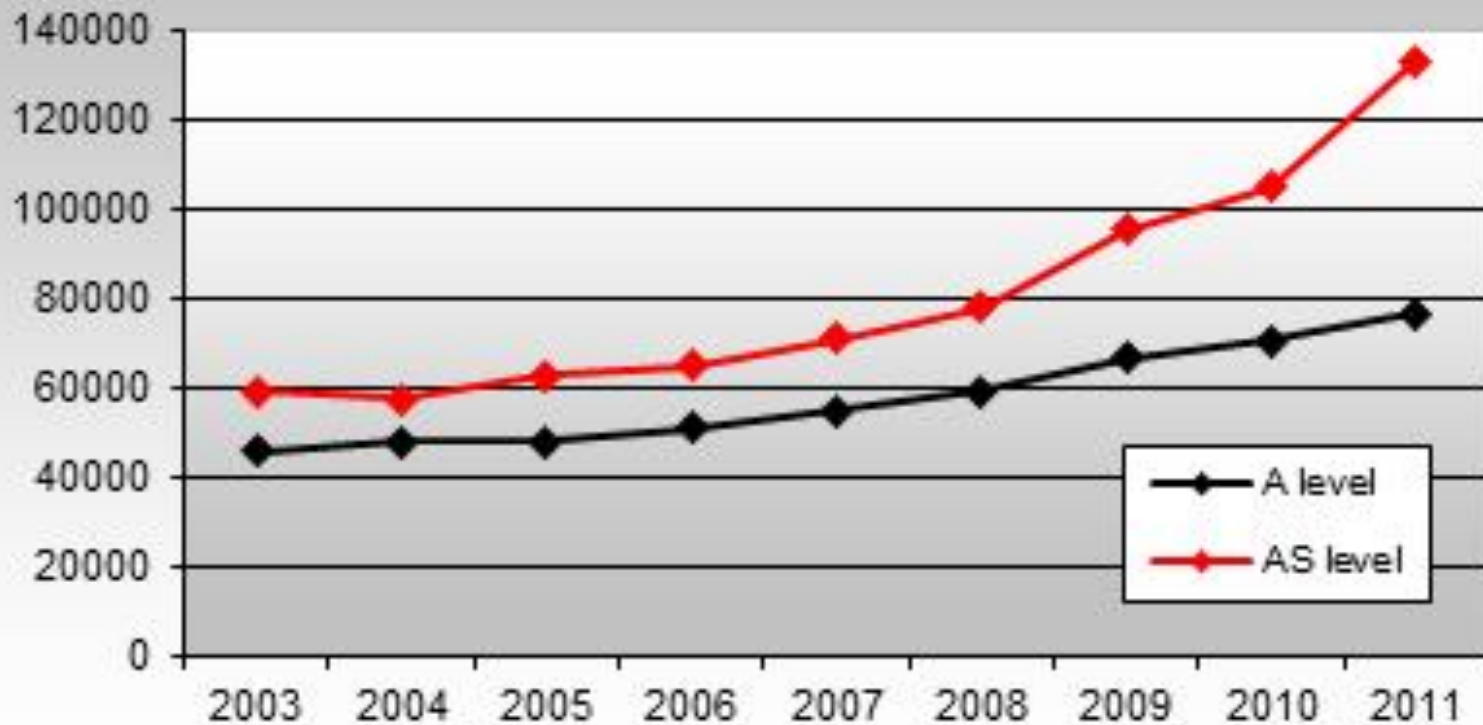


- ❑ Provides CPD for teachers of A level Mathematics and Further Mathematics
- ❑ Provides support with stretch and enrichment alongside GCSE mathematics
- ❑ Provides support to teachers and students with STEP and AEA Mathematics

Growth in A level Mathematics

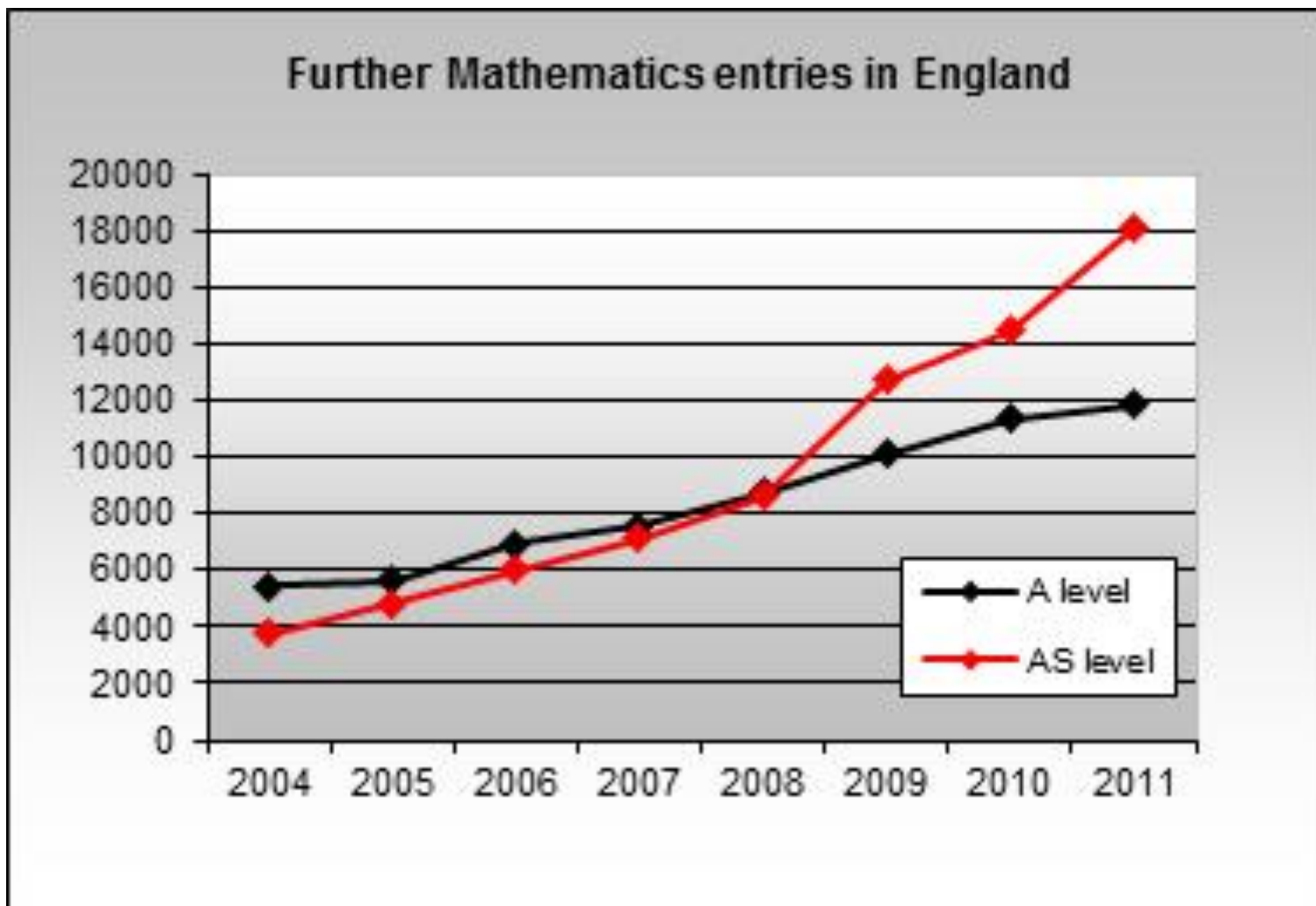


Mathematics entries in England



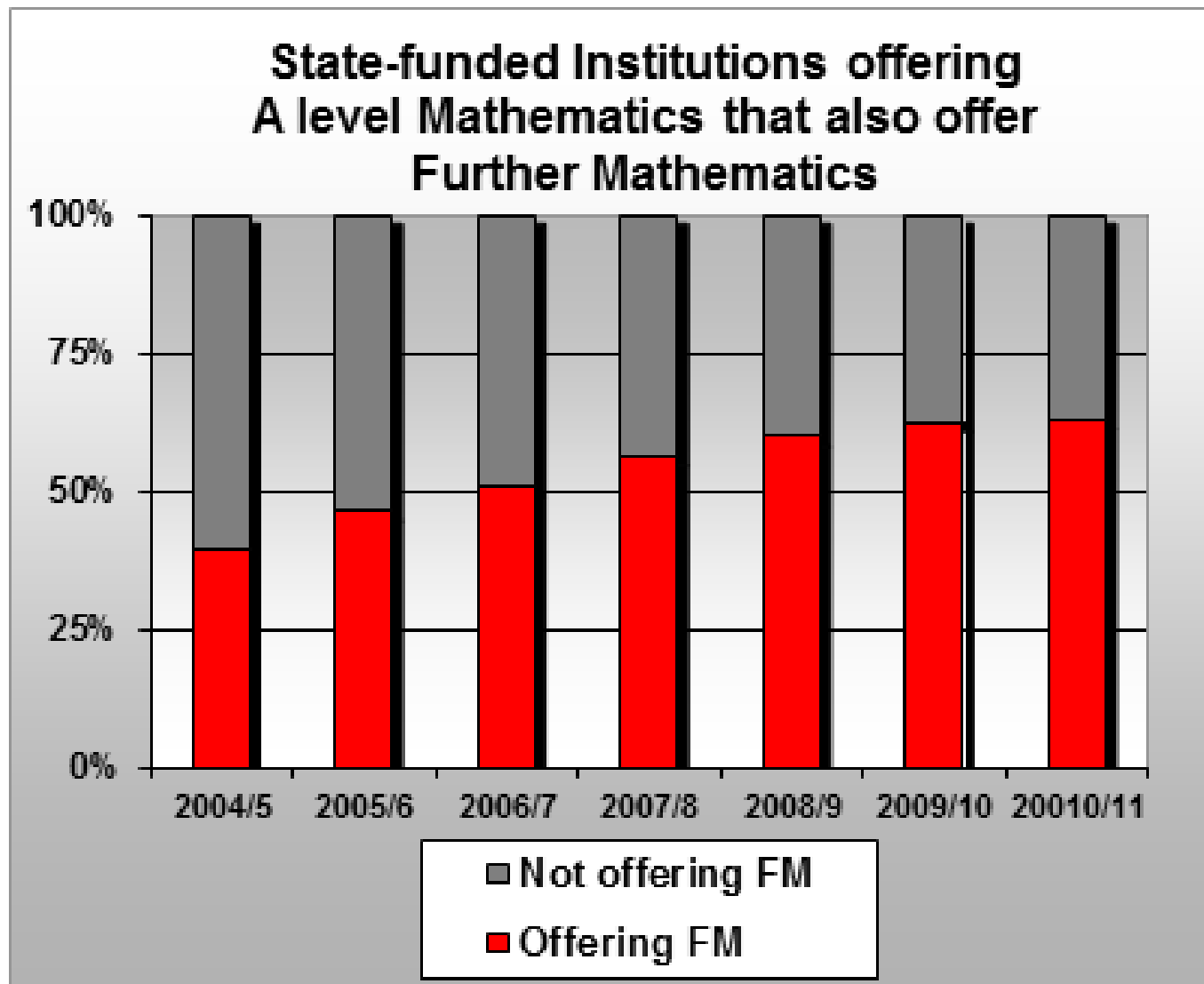
Source: JCQ

Growth in A level Further Mathematics



Source: JCQ

Growth in institutions offering Further Mathematics



Source: DfE

Implications of the growth in A level Mathematics and Further Mathematics

- ❑ **Most** schools and colleges now offer Further Mathematics.
- ❑ Some mathematics university courses now require Further Mathematics A level.
- ❑ Many other university mathematics courses encourage it

Mathematics (G100) admissions



- ❑ 37% of Mathematics degrees at English universities now either require or encourage Further Mathematics:

Durham; **Imperial**; King's College London; **Lancaster University**; Loughborough University; **Oxford**; Queen Mary; **Birmingham**; Manchester; **Warwick**; York; **UCL**; Bath; **Bristol**; Cambridge; **UEA**; Leeds; **Southampton**; Surrey; **Sussex**.

- ❑ The ratio is 65% for Russell Group universities.

Encouraging Further Mathematics



□ University of Birmingham:

Further Mathematics A level or AS level is an excellent preparation for many degree programmes, not just mathematics, and we strongly encourage you to take it if it is available to you. Approximately 40% of our 2007 intake had Further Mathematics A level or AS level.

We typically make a slightly lower offer to students taking A2 Further Mathematics.

Taking Further Mathematics will mean that you have a much better idea of what to expect from our degree programmes because you will have already seen more mathematics.

Encouraging Further Mathematics



□ University of Birmingham:

We are aware that some schools are not able to offer Further Mathematics and so we do not make it a requirement of our offers.

Our first year programmes are, therefore, carefully designed to take into account the different qualifications that students arrive with.

If Further Mathematics is not available at your school, you may be able to take it through the Further Maths Support Programme. For more information, go to www.furthermaths.org.uk

In conclusion



- ❑ A level Mathematics and Further Mathematics are more popular now than at any time in the last ten years and they are both growing fast.
- ❑ The FMSP is providing substantial CPD to improve the teaching of both subjects. This is widely taken up.
- ❑ Universities have a key role in requiring/encouraging students to prepare themselves as best they can for the mathematical demands of their degree programmes.
- ❑ The signals that universities send are vital to all of this work.