TSST 2015-16

Overview

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Purpose of study

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Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

Click for emphasis

Aims

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The national curriculum for mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language

- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Click for emphasis

Aims

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Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

Click for emphasis

Themes

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Concrete, Pictorial, Abstract (CPA)

Multiple Representations

Mastery and Mastery with greater depth

Conceptual Understanding with Procedural Fluency

Regularly Reasoning Mathematically

Solving Problems: a natural part of the Mathematics Programme

National Curriculum (KS3) overview and progression maps from NCETM

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KS3.pdf

KS3_progression_map _algebra.pdf
KS3_progression_map_geometry_and_measures.pdf
KS3_progression_map_number.pdf
KS3_progression_map_probability_and_statistics.pdf
KS3_progression_map_ratio_proportion_and_rates_of_change.pdf

National Curriculum Glossary.pdf
Glossary

The definitions in the glossary refer to the words and terms as they are used in the programmes of study. This document is based on an earlier publication Mathematics glossary for teachers in key stages 1 to 4 published by the Qualifications and Curriculum Authority in 2003. It is intended to be used alongside the 2014 National Curriculum for teachers to check the meaning of the terms.

https://www.ncetm.org.uk/resources/42990
https://www.ncetm.org.uk/public/files/23452319/KS3.pdf

New GCSE (KS4) Content

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KS4 (DfE 2013)
GCSE specifications in mathematics should enable students to:

1. develop fluent knowledge, skills and understanding of mathematical methods and concepts
2. acquire, select and apply mathematical techniques to solve problems
3. reason mathematically, make deductions and inferences and draw conclusions
4. comprehend, interpret and communicate mathematical information in a variety of forms appropriate to the information and context.

Students should be aware that mathematics can be used to develop models of real situations and that these models may be more or less effective depending on how the situation has been simplified and the assumptions that have been made. Students should also be able to recall, select and apply mathematical formulae (see Appendix).

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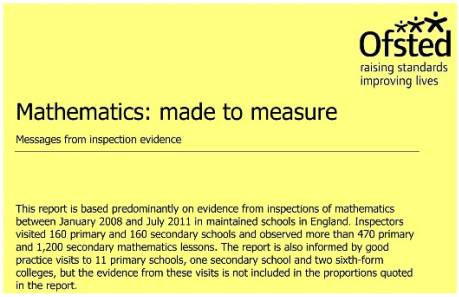
OfSTED 2012, Made to Measure

Schools should:

204. Where satisfactory teaching dominated, pupils often experienced mathematics as a series of apparently unconnected topics, because teachers missed opportunities to make links. For example, they learnt to solve simultaneous linear equations algebraically and later by a graphical method, without any connection being made, so that pupils did not appreciate that the algebraic solution was also the point of intersection of the two straight lines. Teachers typically introduced a new topic by working through one or two straightforward examples. Some gave tips on ways of avoiding common errors. Pupils relied on memorising methods, because teachers emphasised emulating the worked examples rather than why the methods work. Most of the teacher's questions required factual answers only.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Mathematics: made to measure

Messages from inspection evidence

This report is based predominantly on evidence from inspections of mathematics between January 2008 and July 2011 in maintained schools in England. Inspectors visited 160 primary and 160 secondary schools and observed more than 470 primary and 1,200 secondary mathematics lessons. The report is also informed by good practice visits to 11 primary schools, one secondary school and two sixth-form colleges, but the evidence from these visits is not included in the proportions quoted in the report.

http://bit.ly/made2measure

http://bit.ly/made2measuresummary

OfSTED 2012, Made to Measure

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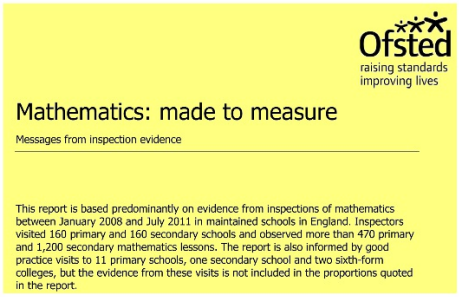
109. Reasoning and proof were not well developed in most of the secondary schools visited. Many high-attaining Year 11 pupils were not familiar with geometric proofs, for instance of the circle theorems, or using algebraic argument, in spite of the inclusion of these in current GCSE specifications. A recent GCSE examination question asked pupils to prove that 'the sum of the squares of two consecutive integers is one greater than twice the product of the integers' and provided an illustrative example, $9^2 + 10^2 = 181$ and $2 \times 9 \times 10 = 180$. The principal examiner's report stated that 'the concepts of algebraic proof were rarely demonstrated well'. This mirrors the weaknesses and gaps in pupils' knowledge noted when inspectors scrutinised their books and practice examination papers and in discussions.



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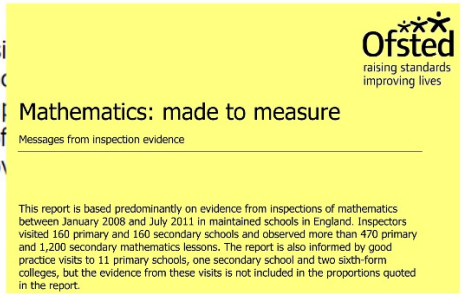
- While the best teaching developed pupils' conceptual understanding alongsi their fluent recall of knowledge, and confidence in problem solving, too muc teaching concentrated on the acquisition of disparate skills that enabled pu to pass tests and examinations but did not equip them for the next stage of education, work and life. Teachers' use of assessment in lessons has improv although it remained a weak aspect of teaching. Monitoring of each pupil's understanding was not strong enough to ensure that pupils learnt and progressed as well as they could.



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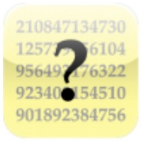

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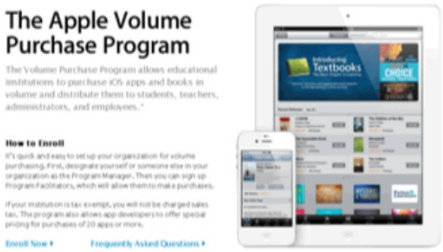

Maths videos at MathsTube

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