

Primary Mathematics Subject Leader Network Meeting (Summer 2023)

- Responding to local and national priorities
- Supporting the mathematics community in Gloucestershire



Aims



- Reflect on national updates and matters arising from spring 2023.
- Review 2023 KS1 and KS2 national curriculum tests.
- Case study: leadership and curriculum developments for mathematics.
- GLOW Maths Hub: 2022/23 reflections and CPD opportunities (2023/24).
- Priorities for improvement planning (2023/24)

Please bring:

- **One copy of each of the 2023 KS1/KS2 mathematics national curriculum tests (plus KS1/KS2 mark schemes.**
- **Your current mathematics improvement/action plan.**

NATIONAL UPDATES and MATTERS ARISING (Spring 2023)

- Matters arising (spring 2023).
- DfE/Ofsted updates.
- Education Endowment Foundation research.
- NCETM updates.

GLOW MATHS HUB (ED NEALE, MATHS HUB LEAD)

- 'TA subject knowledge' CPD programme.
- CPD opportunities (2023/24).

2023 KS1/KS2 NATIONAL CURRICULUM ASSESSMENT

- Reflections of 2023 KS1/KS2 national curriculum tests.
- 2023 multiplication tables check (MTC).
- The formative use of summative assessment.

IMPROVEMENT PLANNING (2023/24)

- NCETM '5 Big Ideas' and Ofsted School inspection handbook.
- EEF 'Evidence into Action', NRICH and HFL Education.

THE USE OF 'BAR MODELLING' AS A REPRESENTATION TO SUPPORT TEACHING AND TO HELP PUPILS UNDERSTAND MATHEMATICAL STRUCTURE.

FLORA TURNER (MATHEMATICS SUBJECT LEADER, WINCHCOMBE ABBEY C E PRIMARY ACADEMY)

Subject leaders will:

- understand the rationale underpinning an identified area for improvement;
- learn about the process of leading, monitoring and evaluating an aspect of curriculum development;
- gain an insight into practical approaches to effect change; and
- reflect on implications for their own setting.

Matters Arising: Spring 2023

Nathan Crook (Education Consultant)

Providing equity to learners within 'teaching for mastery' in mathematics

- How representations and structure, mathematical thinking, variation and fluency can be used in ways where pupils gain access to age-appropriate concepts.

DfE, November 2022

Official Statistics
Multiplication tables check attainment: 2022

2022 Y4 MTC (mean average score)	Total	Boys	Girls
England	19.8	20.0	19.6
Gloucestershire	19.1	19.4	18.8
South West	19.1	19.4	18.9

Primary assessments: future dates

Future dates for the key stage 1 and key stage 2 tests (commonly referred to as SATs), phonics screening check, multiplication tables check and reception baseline assessment.

Guidance

Key stage 2: guide to registering pupils for the tests

Statutory participation in trialling of national curriculum assessments

'Added downloadable calendars with important 2023 assessment dates for KS1 and KS2.'
[STA, March 2023]

PRIMARY CALCULATION GUIDANCE

6 + 4 = 10
4 + 6 = 10
10 - 4 = 6
10 - 6 = 4

There are 10 pears. $\frac{1}{2}$ of the pears is equal to 5 pears.

There are 10 pears. $\frac{1}{2}$ of the pears is equal to 5 pears.

11,576 + 8,058 = 19,634
Convince me that this is the correct answer.

72.5 + 45.73 =

47 + 9 = 56
Convince me that this is the correct answer.

15 + 28 =

3,243 km + 18.07 km = 21.313 km
Convince me that this is the correct answer.

2,607 + 879 =

15 ÷ 5 = 3
Convince me that this is the correct answer.

Four eggs fit in a box.
How many boxes do you need to pack 20 eggs?

1,118 ÷ 43 = 26
Convince me that this is the correct answer.

29.75 ÷ 7 =

51 ÷ 3 = 17
Convince me that this is the correct answer.

68 ÷ 4 =

EYFS statutory framework (September 2021)

Mathematics Educational Programme

Children should be able to count confidently, develop a deep understanding of the numbers to 10, the relationships between them and the patterns within those numbers. By providing frequent and varied opportunities to build and apply this understanding – such as using manipulatives, including small pebbles and tens frames for organising counting – children will develop a secure base of knowledge and vocabulary from which mastery of mathematics is built.

Early learning goals (ELGs)

- Number**
- Have a deep understanding of number to 10, including the composition of each number
 - Subitise (recognise quantities without counting) up to 5
 - Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts
- Numerical patterns**
- Verbally count beyond 20, recognising the pattern of the counting system
 - Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity
 - Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally

Welcome to the Primary Teacher homepage

- Primary Curriculum
- Working Mathematically
- Features
- Professional Development
- News and Recent Solutions
- Tweets from @nichmaths

EEF blog: Using Storybooks to Promote High-quality Talk in Maths

Kirstin Mulholland, maths content specialist, explains how storybooks can play an important role in Maths

EEF blog: Scaffolding High-quality Talk in Maths

Techniques for scaffolding talk in mathematics lessons

PROMOTING HIGH QUALITY TALK IN MATHEMATICS

Evidence indicates that high-quality talk can play an important role in supporting learning. This is reflected in multiple recommendations across the EEF's 'Improving Mathematics at the GS, HS and Key Stage 1' and 'Improving Mathematics at Key Stages 2 & 3' guidance reports. The 'TOL' acronym summarises four key principles to encourage productive talk in mathematics lessons:

- T**AKE PART: To ensure that all pupils participate in high-quality talk, we must encourage and support the involvement of all pupils in the talk, not just the quality of their contributions.
- O**PPORTUNITIES: To ensure opportunities to having a complete go for all pupils, we must ensure that all pupils have the opportunity to have a complete go for all pupils. Opportunities should be provided for all pupils to have a complete go for all pupils. Opportunities should be provided for all pupils to have a complete go for all pupils.
- I**NK: To ensure that all pupils have a complete go for all pupils, we must ensure that all pupils have the opportunity to have a complete go for all pupils. Opportunities should be provided for all pupils to have a complete go for all pupils.
- D**EBATE: To ensure that all pupils have a complete go for all pupils, we must ensure that all pupils have the opportunity to have a complete go for all pupils. Opportunities should be provided for all pupils to have a complete go for all pupils.

Maths Hubs Programme Annual Report 2021/22

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1. Introduction
2. Primary schools
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'What Maths Hubs did for schools, colleges and pupils in 2021/22. A new report with case studies, quotes and statistics.'

Living our values every day



GLOW MATHS HUB

- 'TA subject knowledge' CPD programme.
- CPD opportunities (2023/24).

*'Ensuring impact,
effectiveness and
pupil progress'*
(NCETM article,
March 2023

PROFESSIONAL
DEVELOPMENT FOR
PRIMARY TEACHING
ASSISTANTS

'THEY CAN SEE IT STRAIGHT AWAY': THE IMPACT OF MASTERING NUMBER

‘Successful implementation of Mastering Number has brought huge benefits to pupils in a mixed-age class.’

When **Michael Hares**, AHT and maths subject leader at **Whixall C of E Primary** in Shropshire, heard about ‘Mastering Number’ in 2021, he had no hesitation in his school joining the programme.

As a Mastery Specialist, Michael understands the importance of developing pupils’ knowledge of key number facts, knowing that this supports both procedural fluency and conceptual understanding. Although teachers at Whixall had been working hard on this for some years, many children were still not developing sufficient fluency by the end of KS1.

Why choose ‘Mastering Number’?

Situated in rural North Shropshire, Whixall has about 160 pupils from Nursery to Y6, including two classes that are mixed-age. **Sue Evans**, Assistant Director for Primary at the NCETM, visited Whixall to find out about the school’s involvement in the [Mastering Number Programme](#).

Michael began by explaining what had appealed to him about the programme:

- its systematic approach and clear progression through Reception to Y2;
- the use of small steps in learning;
- how it supports pupils to understand the relationships between numbers, to develop their ‘number sense’;
- the focus on subitising and how numbers are composed;
- the use of precise mathematical language; and
- the careful choice of representations, including the *rekenrek*, to expose the structure of numbers.

MATHS HUBS CPD OPPORTUNITIES FOR 2023/24 NOW AVAILABLE

‘Details of the new opportunities for schools to work with Maths Hubs and the NCETM in 2023/24 are now available. Whatever your current position, there’s something for your own professional development, or to develop maths teaching across your department or school. Professional development projects are aimed at teachers and leaders in all school and college phases, from Early Years to post-16.’

2023/24

Maths Hubs Professional and School Development Opportunities

Discover fully funded subject-specific opportunities to support professional learning for teachers and development for departments and schools.



MATHSHUBS

NCETM
NATIONAL CENTRE FOR EXCELLENCE
IN THE TEACHING OF MATHEMATICS

ncetm.org.uk | @NCETM

Coordinators of the Maths Hubs Programme

Living our values every day



Accountable



Integrity



Empower



Respect



Excellence



NATIONAL UPDATES

- Matters arising (spring 2023).
- DfE/Ofsted updates.
- Education Endowment Foundation research.
- NCETM updates.



2023 Teacher Assessment

Data submission deadlines: Click [here](#)

Friday 30 June	EYFS profile [Gloucestershire LA]
Tuesday 27 June	KS1 : reading, writing, mathematics and science [Gloucestershire LA]
Friday 30 June	KS2 : writing, science (plus reading and mathematics for pupils working below the standard of national curriculum tests).

Analyse school performance

 **GOV.UK**

**Department for Education
Sign-in**

Sign-in to access DfE online services.

Email address

Password

Show

[Forgotten your password?](#)

IDSR: news and updates

May 2023: Updated the IDSR for all schools: KS2 final (including Y4 MTC); and 2021/22 absence data (all three terms).

Question level analysis year 6

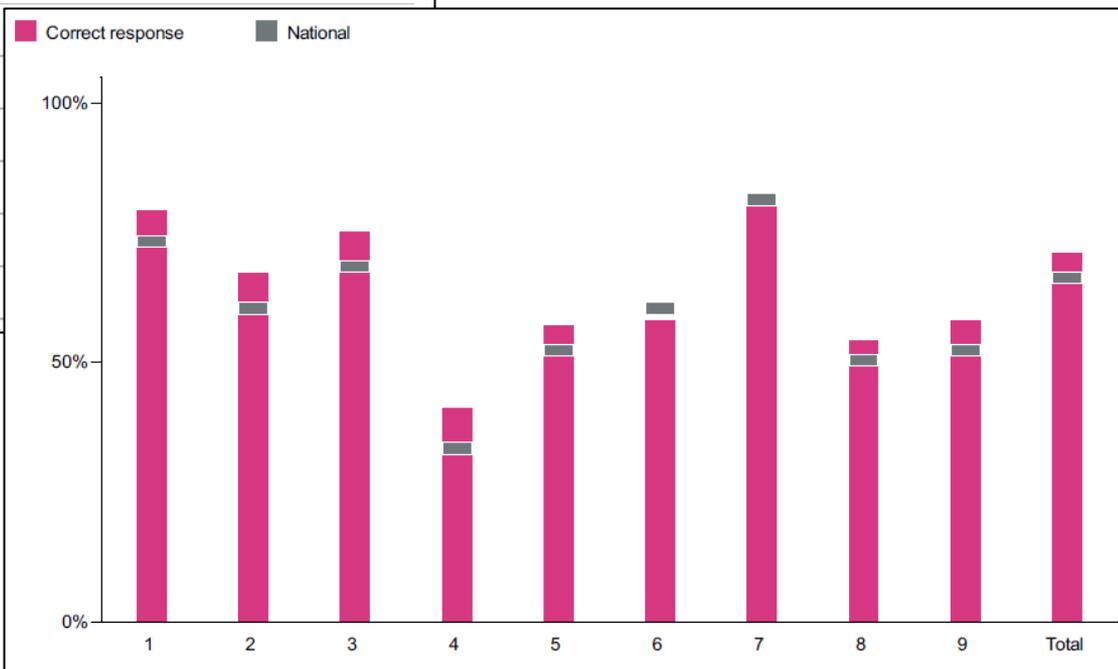
This section allows you to assess how your pupils performed in the key stage 2 tests by subject strand, by question and by individual pupils and compare these with the national average.

This is QLA 2021/2022 data.

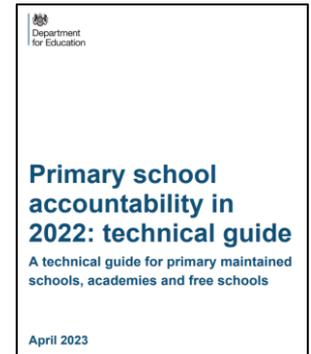
Maths All papers combined

Based on the cohort of 53 pupils.

Strand	Marks available	Correct response %	National %	Difference
1. Addition, subtraction, multiplication and division (calculations)	42	79	73	6
2. Algebra	3	67	60	7
3. Fractions, decimals and percentages	24	75	68	7
4. Geometry - position and direction	3	41	33	8
5. Geometry - properties of shapes	6			
6. Measurement	11			
7. Number and place value	9			
8. Ratio and proportion	7			
9. Statistics	5			
Total	110			



The DfE has updated the [Primary school accountability technical guide](#) (20.04.23) with a holding statement regarding calculation of KS2 average progress scores for the academic years affected by COVID-19:



‘As primary tests and assessments were cancelled in academic years 2019/20 and 2020/21 due to COVID-19 disruption, there will be gaps in the prior attainment data available to calculate primary progress measures in future years. This will affect primary progress measures when the relevant cohorts reach the end of KS2 in 2023/24 and 2024/25. We will be doing further analytical work and testing as we explore whether there are alternative options for producing primary progress measures in the affected years, and will announce our approach in due course.’





Research and analysis

Independent review of teachers' professional development in schools: phase 1 findings

Published 10 May 2023

'The DfE has commissioned Ofsted to carry out an independent review of teachers' professional development. This review focuses on teachers' and leaders' experiences of the training and development they have engaged in since April 2021. This report sets out the interim findings from the first year of our review.'

- **Workload barrier for most teachers**
- **CPD often poor quality**
- **Limited awareness of reforms**
- **Online CPD 'boring'**
- **'Preparing for inspection' courses criticised**
- **Impact of wellbeing focus 'unclear'**
- **Teachers want more SEND training**

‘Our *Calculator Crunch* programme is a fun way to engage Y6 pupils with maths whilst also developing their confidence with calculators so they’re ready for maths at secondary school. The activities provide extra practice for Y6 and Y7 pupils in key areas of the maths curriculum.’

Calculator Crunch 2022

Challenges from the Calculator Crunch 2022 competition

Calculator Crunch 2019

Challenges from the Calculator Crunch competition in 2019

Calculator Crunch 2020

Challenges from the Calculator Crunch competition in 2020

Calculator Crunch 2021

Challenges from the Calculator Crunch competition in 2021

**Calculator Crunch 2020:
Learn from home**

Learn from home versions of the challenges from the Calculator Crunch competition in 2020

**Calculator Crunch 2019:
Learn from home**

Learn from home versions of the challenges from the Calculator Crunch competition in 2019

- Choose 4 digits from 1 to 9 and use them to create a fraction
- There are lots of ways to make $\frac{1}{4}$. Can you find them all?
- How do you know if a fraction is equal to $\frac{1}{4}$?
- What decimal is equivalent to $\frac{1}{4}$?
- Use your calculator to convert your fraction into a decimal
- How could you make a fraction just more than $\frac{1}{4}$?
- What about just less than $\frac{1}{4}$?

1	2	3
4	5	6
7	8	9

How can you use the calculator to convert your fractions to decimals?

National Numeracy Day 2023: What we're doing to support children, young people and adults with maths

Take a quick numeracy quiz

Answer these 6 questions to help you understand areas of numeracy you might want to improve.

The questions have:

- no pass or fail mark
- multiple-choice options for answers

It should take around 5 minutes to complete all the questions and you can use a calculator if you wish.

[Start](#)

DfE Education Hub, May 2023

Multiply

Multiply is a new government-funded programme to help adults improve their numeracy skills.

If you're aged 19 and over and don't have maths GCSE at grade C (or equivalent), you can access free numeracy courses through Multiply to build your confidence with numbers and gain a qualification.

Good numeracy skills may unlock job opportunities and lead to higher wages or prepare you for further study. They also help in everyday life, such as helping children with homework and budgeting money.

There are courses for beginners to more advanced courses such as GCSE Maths, Functional Skills Qualifications, or equivalent, so you will be able to learn at a pace that suits you.

2023 KS1 and KS2 NATIONAL CURRICULUM ASSESSMENT

- Reflections of 2023 KS1/KS2 national curriculum tests.
- 2023 multiplication tables check (MTC).
- The formative use of summative assessment.



2023 KS1/KS2 National Curriculum Tests

Collection

National curriculum assessments: practice materials

Practice materials for the phonics screening check, key stage 1 and key stage 2 national curriculum tests, including past test papers.

2023 national curriculum tests

Key stage 1

Mathematics

Paper 1: arithmetic

2023 national curriculum tests

Key stage 1

Mathematics

Paper 2: reasoning

2023 national curriculum tests

Key stage 1

**Mathematics test
mark schemes**

Paper 1: arithmetic
Paper 2: reasoning

2023 national curriculum tests

Key stage 2

Mathematics

Paper 1: arithmetic

2023 national curriculum tests

Key stage 2

Mathematics

Paper 2: reasoning

2023 national curriculum tests

Key stage 2

Mathematics

Paper 3: reasoning

2023 national curriculum tests

Key stage 2

**Mathematics test
mark schemes**

Paper 1: arithmetic
Paper 2: reasoning
Paper 3: reasoning



Understanding scaled scores at key stage 1

‘At the end of KS1, pupils take national curriculum tests in mathematics and English reading. They may also take an optional English GPS test. Teachers will take a pupil’s performance in the tests into account when making their TA judgements. These judgements are used to report on the progress of pupils at the end of the key stage.’ [STA, 01.06.23]

2023 scaled scores at key stage 1

‘A scaled score between 100-115 shows the pupil has met the expected standard in the test. The lowest scaled score that can be awarded on a KS1 test is 85. The highest score is 115.’

The marks required to meet EXS in 2023 for each KS1 test are:

- **mathematics: 35 out of 60 (same as [2022](#));**
- English reading: 25 out of 40 (down from 26 in 2022); and
- English GPS: 23 out of 40 (down from 24 in 2022).

Mathematics

Raw score	Scaled score
0	No scaled score
1	No scaled score
2	No scaled score
3	85
4	85
5	85
6	85
7	85
8	86
9	86
10	87
11	88
12	89
13	89
14	90
15	90
16	91
17	91
18	92
19	93
20	93
21	94
22	94
23	94
24	95
25	95
26	96
27	96
28	97
29	97
30	98

Raw score	Scaled score
31	98
32	98
33	99
34	99
35	100
36	100
37	101
38	101
39	102
40	102
41	103
42	103
43	104
44	104
45	105
46	105
47	106
48	106
49	107
50	108
51	108
52	109
53	110
54	111
55	111
56	112
57	114
58	115
59	115
60	115

2023 national curriculum tests

Key stage 1

Mathematics test mark schemes

Paper 1: arithmetic

Paper 2: reasoning

Table 1: Content domain coverage for Paper 1 and Paper 2

Paper 1: arithmetic		Paper 2: reasoning	
Question	Content domain reference	Question	Content domain reference
1	1C2a/2C1	1	1C1/1N4
2	2N1/1N1b	2	2N3
3	1C2a/2C1	3	1M3
4	2C6	4	2C4/2C1
5	2N1/1N1b	5	2C6
6	2N6	6	2N2a/1N2c
7	2C6	7	2S1
8	2C1	8	2G1a/2G2a
9	2C2b	9	1G1b/2G1b
10	2C2b	10	2M4b/1M4b
11	2C6	11	2N2b
12	2C6	12	2N1/2N4
13	2C6	13	1C4/1C2a
14	2C2b	14	2C1/1C2a/1C1
15	2F1a/1F1a	15	2S1
16	2C2b	16	2C8
17	2N6/2C2b	17	2N4/2C2b/2N3
18	2C2b	18	2C4/2N6/2C2b
19	1C4	19	2C7/1C2b
20	2C3	20	2C1/2N1/2N6
21	2F1a	21	2C8/2C7
22	2F1a	22	2F1b/2F1a
23	2C2b	23	2M9
24	2C2b	24	1F1a/1C8
25	2C2b	25	2C8/2C4
		26	2M9/2C4
		27	2C8/2C4
		28	2P2
		29	2C4
		30	2N6/2C3
		31	2C3/2C1
		32	2N1/2C6/2N6

2023 national curriculum tests

Key stage 2

Mathematics test mark schemes

Paper 1: arithmetic
Paper 2: reasoning
Paper 3: reasoning

Table 1: Content domain coverage of the 2023 key stage 2 mathematics test

Where 2 or more references are given, the primary reference is given first.

Paper 1: arithmetic		Paper 2: reasoning		Paper 3: reasoning	
Qu.	Content domain reference	Qu.	Content domain reference	Qu.	Content domain reference
1	3N2b	1	3M4c/4N3b	1	3N3
2	4C2	2	5N5	2	5N2/5N3a
3	4C7	3	4P3a/4P3b	3	6P2
4	4C2	4	3S2	4	5N1/6A3
5	4C6b	5	6R4/6A5	5	4F7
6	5C6b	6	4M9/3M9a	6	6N3
7	5F8/5F10	7	4N5/4N1/6A3	7	3F1c/3F10
8	4C2	8	4N4b	8	5G2b
9	4C6b	9	6G5	9	3C6
10	3C7	10	4C3/3C8	10	5C5d
11	4C6b	11a	5N1/4N2b	11	4C4
12	3C1	11b	5N1/4N2b	12	6G3b
13	4C6b	12	4G2b	13	6C8/6C9
14	6F5a	13	5F5/4F10a	14a	5F11/5F12
15	5C7b	14	5G4c/5G4a	14b	5F11/5F12
16	5F4	15	5F3/6F3	15a	3M4d/3M4f/4M4b
17	6F9a	16	5C8c/3M4f	15b	3M4f
18	5F4	17	5C8b/5C7b	16	6C7b/6C8/6C6
19	5F8/5F10	18	5F4/6F2	17	6F4/6F11
20	6C7a	19	5C8a/5C6a	18a	5S1/4S1
21	6F5b	20	6C7a/6C8	18b	6S3/6C8
22	4F4	21	5M6	19	5M9c/5M9a
23	6C9	22	4F2/5F4	20	6A1/4M7a
24	6F9b	23	6R2/6C8	21	6R2
25	6C7b	24	6S1/6R2	22	6A3/6G2a
26	5C7b	25a	5C8a/5C6a	23	6F6/6F11
27	6R2	25b	5M9c/5M5/5F10		
28	6F5b	26a	6A2/6C9		
29	6C7a	26b	6A2/6C9		
30	6R2				
31	6F9b				
32	3F4/3C4				
33	6C7b				
34	6F4				
35	6R2				
36	5F5				

National curriculum assessments: information for parents (STA Collection, updated 5 June 2023)

Information for parents/carers about the national curriculum assessments for pupils in primary school.

Taking the tests

[Key stage 1 and 2 national curriculum tests: information for parents](#)

2 May 2023 Promotional material

[Reception baseline assessment: information for parents](#)

16 May 2022 Promotional material

[Phonics screening check: information for parents](#)

5 June 2023 Guidance

[Multiplication tables check: information for parents](#)

4 November 2022 Promotional material

[The engagement model: information for parents](#)

1 December 2021 Promotional material

Results and school accountability

[Results at the end of key stage 1: information for parents](#)

10 June 2019 Promotional material

[Results at the end of key stage 2: information for parents](#)

10 June 2019 Promotional material

[Primary school progress measures: information for schools and parents](#)

1 March 2017 Promotional material



MTC: validity framework (STA, May 2023)

‘The framework of the MTC provides validity evidence gathered throughout every stage of the development of the assessment.’

2022 Validity Framework
Multiplication tables check
May 2023

Claim 1: The Multiplication tables check is representative of multiplication fluency in the curriculum

The national curriculum for mathematics states:

‘By the end of Y4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work’.

It goes on to state:

‘Pupils should be taught to recall multiplication and division facts for multiplication tables up to 12×12 ’.

Element of content domain not assessed by the MTC	Rationale	How the element could be assessed
Related division facts	The MTC tests the fluency of pupils’ recall of multiplication facts. Related division facts would not be assessable due to the timed, fluent recall element of this assessment.	End of key stage 2 national curriculum assessments Teacher assessment
Application of multiplication facts in mathematical context (e.g. word problems) or situational context (e.g. across all areas of ‘their work’)	The MTC tests the fluency of pupils’ recall of multiplication facts. Application or situational context cannot be assessed effectively within the timed construct of this assessment.	End of key stage 2 national curriculum assessments Teacher assessment
Strategies employed	A timed, digital test which is designed to assess recall is not an appropriate format to assess the strategies pupils use to calculate their times tables facts.	Teacher assessment

Table 1: Non-assessable elements of the content domain

Collection

Multiplication tables check

‘Information and guidance about the MTC.’ [November 2022]

Contents

- [Current guidance](#)
- [Information for parents](#)
- [Privacy notice](#)
- [Assessment framework](#)

‘The MTC is statutory for all Y4 pupils ... the purpose is to determine whether pupils can recall their times tables fluently ... It will help schools to identify pupils who have not yet mastered their times tables, so that additional support can be provided.’

‘Schools must administer the MTC to all eligible Y4 pupils between **Monday 5 June** and **Friday 16 June 2023**.

Schools can use the following week, Monday 19 June to Friday 23 June, to administer the check to any pupils who were absent during the first two weeks or in case of any delays to the administration of the check due to technical difficulties.

Schools can access the MTC service to prepare for the check via [DfE Sign-in](#) from Monday 17 April 2023.’

National curriculum assessments helpline: 0300 303 3013 or email assessments@education.gov.uk.



Multiplication tables check attainment: 2022

DfE, November 2022

Headlines

- All pupils: **mean average score was 19.8** out of 25.
- **Modal score was 25** (full marks), with **27%** of pupils achieving this score.
- Disadvantaged pupils performed less well in the check than other pupils. Of pupils who took the check, the **average score for disadvantaged pupils was 17.9**, while the **average score for pupils not known to be disadvantaged was 20.5**.
- Pupils with a first language of English performed less well in the check than pupils with EAL. Of pupils who took the check, the **average score for pupils with a first language of English was 19.4** while the **average score for pupils with EAL was 21.2**.
- London was the highest performing region, with an average score of 20.9. In other regions, the average score ranged from 19.1 in the South West to 19.9 in the North West and the West Midlands.

2022 Y4 MTC (mean average score)	Total	Boys	Girls
England	19.8	20.0	19.6
Gloucestershire	19.1	19.4	18.8
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2023/24 IMPROVEMENT PLANNING

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- EEF 'Evidence into Action', NRICH and HFL Education.



The distinction between curriculum, pedagogy and assessment



Curriculum



Pedagogy



Assessment

*‘When thinking about how all pupils can develop expertise in mathematics, it’s really useful to draw a distinction between the **curriculum**, **pedagogy** and **assessment**.’*

- Curriculum **['WHAT']**: what pupils will learn.
- Pedagogy **['HOW']**: the nature of the teaching and the rehearsal.
- Assessment **['CHECK']**: what is known, understood and remembered.

Curriculum thinking should happen first, followed by the pedagogies. This helps to avoid situations where pedagogies are considered first, rather than pupils’ intended learning.

‘DEEP DIVE’: MATHEMATICS

‘Mathematical fluency and confidence in numeracy are regarded as preconditions of success across the national curriculum.’

[Ofsted: [An investigation into how to assess the quality of education through curriculum intent, implementation and impact](#), December 2018]

Ofsted: [School inspection handbook](#) (from September 2022)

Para 205: ‘In KS1, inspectors need to check that pupils are able to (read, write and) use mathematical knowledge, ideas and operations so they are able to access a broad and balanced curriculum at KS2.’

Para 246: ‘When inspectors look at mathematics, they will evaluate the quality of a school’s mathematics education through lesson visits, discussions with pupils and scrutiny of their work, reviewing curriculum plans, discussions with curriculum leaders, and examining any published data. This will include understanding how mathematics is taught remotely, where applicable.’

ASPECT	Mathematics (School inspection handbook, para 247) <i>‘Inspectors will consider what steps the school has taken to ensure that:’</i>	PROMPTS/QUESTIONS FOR REFLECTION AND SELF-EVALUATION*	NEXT STEPS
Teaching that builds on pupils’ prior learning	<i>‘Pupils understand and remember the mathematical knowledge, concepts and procedures appropriate for their starting points, including knowledge of efficient algorithms. This should also ensure that pupils are ready for the next stage, whether that is the next lesson, unit of work, year or key stage, including post-16 mathematics.’</i>	<ul style="list-style-type: none"> ▪ A high priority is given to all pupils developing secure and deep understanding of each key learning point. 	
Curriculum progression and ‘connectedness’ of learning	<i>‘The school’s curriculum planning for mathematics carefully sequences knowledge, concepts and procedures to build mathematical knowledge and skills systematically and, over time, the curriculum draws connections across different ways of looking at mathematical ideas.’</i>	<ul style="list-style-type: none"> ▪ What are the key ideas and building blocks in learning? ▪ The curriculum is mapped clearly to support transition and ensure pupils acquire knowledge and skills relevant to their year group. ▪ Over time, pupils recognise a concept, idea or technique with increasing independence in new situations and contexts. 	
Coherence: lessons characterised by key learning points	<i>‘The curriculum divides new material into manageable steps lesson by lesson.’</i>	<ul style="list-style-type: none"> ▪ Carefully crafted lesson design provides a step-by-step, conceptual journey through the mathematics, engaging pupils in reasoning and the development of their mathematical thinking. 	
Mathematical thinking	<i>‘The school’s curriculum identifies opportunities when mathematical reasoning and solving problems will allow pupils to make useful connections between identified mathematical ideas or to anticipate practical problems they are likely to encounter in adult life. Pupils have sufficient</i>	<ul style="list-style-type: none"> ▪ Teachers design: lessons that incorporate variation (i.e. <i>What it is</i> and <i>What it’s not</i>); and tasks that enable pupils to solve problems (routine/non-routine), applying to different contexts. 	

Representation and structure of mathematics	<i>approaches that enable pupils to understand the mathematics they are learning.’</i>	high quality resources to support lesson planning? <ul style="list-style-type: none"> ▪ Concrete/pictorial representations are chosen carefully to help build pupils’ procedural and conceptual knowledge together. 	
Teachers’ subject expertise	<i>‘All teachers of mathematics, including non-specialist teachers of mathematics, have sufficient mathematical and teaching content knowledge to deliver topics effectively.’</i>	<ul style="list-style-type: none"> ▪ The curriculum leader facilitates a planned, bespoke programme of CPD for all practitioners. 	
Numeracy in other curriculum subjects	<i>‘Pupils’ mathematical knowledge is developed and used, where appropriate, across the curriculum.’</i>	<ul style="list-style-type: none"> ▪ Curriculum design provides opportunities for pupils to apply mathematical knowledge, understanding and skills in other subjects. ▪ Pupils make use of a concept, idea or technique in new situations. 	

Pupils with SEND in both mainstream and specialist settings

Ofsted's approach to evaluating the curriculum

214. 'Inspectors will focus on what our inspection experience and research show are the most important factors to consider. These are the extent to which:

- the school's curriculum;
- is ambitious and designed to give pupils, particularly disadvantaged pupils and pupils with SEND, the knowledge they need to take advantage of opportunities, responsibilities and experiences in later life; and

250. 'Inspectors will gather and evaluate evidence about ...

... whether leaders are suitably ambitious for all pupils with SEND;

... how well leaders identify, assess and meet the needs of pupils with SEND, including when pupils with SEND are self-isolating and/or receiving remote education;

... how well leaders ensure that the curriculum is coherently sequenced to meet all pupils' needs, starting points and aspirations for the future;

... how successfully leaders involve parents, carers and, as necessary, other professionals/specialist services in deciding how best to support pupils with SEND, including agreeing the approach to remote education;

... how well leaders include pupils with SEND in all aspects of school life;

... how well leaders ensure that pupils' outcomes are improving as a result of any different or additional provision being made for them, including any reasonable adjustments in remote education provision. This covers outcomes in:

- communication and interaction;
- cognition and learning;
- physical health and development; and
- social, emotional and mental health;

... how well pupils with SEND are prepared for their next steps in education, employment and training and their adult lives, including: further/higher education and employment, independent living, participating in society and being as healthy as possible in adult life.'

[See [SEND code of practice: 0 to 25 years.](#)]

cluding when delivered remotely

ND:
ucceed in life;
and are able to do more. They

levant;
ing or employment at each stage
e ready for the next stage and
d are able to read to an age-
e of accessing the rest of the

es

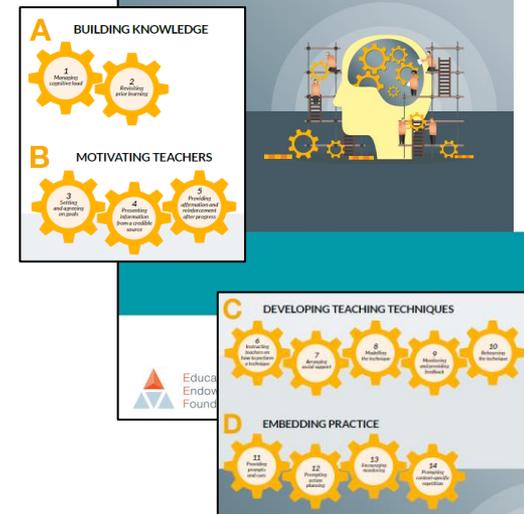
is in order to improve their
and conduct that reflects the
ion are likely to include
hese pupils, taking account of

ials and groups, such as pupils
;small sample of these pupils, how
pils with SEND, children looked
ads. In order to do this,
pupils and consider the way the
child receives the support they
)priate reasonable adjustments
D code of practice.'

Prompts to support self-evaluation

Mathematics subject leader self-evaluation prompts:

- subject aims, lesson design/intent and timetable commitment;
- knowledge, understanding and skills' progression (YR-Y6);
- changes made to curriculum plans in light of COVID-19;
- the contribution that CPD makes to teaching expertise (ref [Effective Professional Development](#), Education Endowment Foundation, October 2021);
- curriculum adaptations for pupils with additional needs, reconciling this with the [School inspection handbook](#) (para 250) and EEF [guidance](#);
- evidence that pupils know more, remember more and are able to do more over time (including use of formative and summative assessments);
- the contribution made to: school vision and values; cultural capital; pupils' wider development; SMSC; and British values;
- extra-curricular opportunities; and
- collaboration with other settings (primary/secondary) plus extended stakeholder community.





High quality teaching: The 'five-a-day' principle

VOICES FROM THE CLASSROOM

Supporting pupils with SEND:
The Five-a-day approach in practice

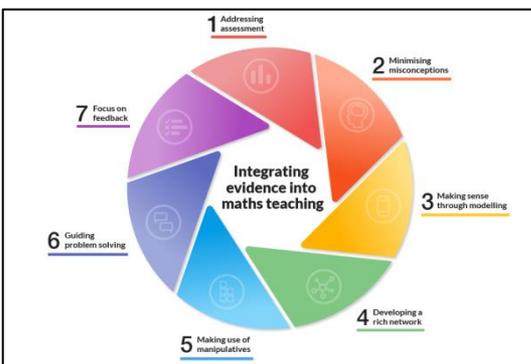
Jessica James, Resourced Provision Lead Teacher/Year 4 class teacher
Ashfield Junior School

VOICES FROM THE CLASSROOM

The role of the SENDCo: Developing staff partnerships
to support high quality teaching

Sarah Hill, Assistant Principal, Laureate Academy
Jess Wood, SENDCo, Laureate Academy





IMPROVING MATHEMATICS IN THE EARLY YEARS AND KEY STAGE 1 Guidance Report

Five recommendations (3-7 year-olds), January 2020

IMPROVING MATHEMATICS IN KEY STAGES TWO AND THREE Guidance Report

Eight recommendations (7-14 year olds), November 2017

SUPPORT FOR MATHEMATICS SUBJECT LEADERSHIP

Department for Education

Mathematics programmes of study: key stages 1 and 2

National curriculum in England

Mathematics guidance: key stages 1 and 2

Non-statutory guidance for the national curriculum in England

DfE/NCETM, June 2020

TEN ASPECTS OF A 'DEEP DIVE' IN MATHEMATICS

ASPECT	OFSTED: THE TEACHING OF MATHEMATICS (SECTION 5 HANDBOOK, PARA 346) INSPECTORS WILL CONSIDER WHAT STEPS THE SCHOOL HAS TAKEN TO ENSURE THAT:	PROMPTS/QUESTIONS FOR REFLECTION AND SELF-EVALUATION*	NEXT STEPS
Teaching that builds on pupils' prior learning	<i>'Pupils understand and remember the mathematical knowledge, concepts and procedures appropriate for their starting points, including knowledge of efficient algorithms. This should also ensure that pupils are ready for the next stage, whether that is the next lesson, unit of work, year or key stage, including post-16 mathematics.'</i>	<ul style="list-style-type: none"> A high priority is given to all pupils developing secure and deep understanding of each key learning point. 	
Curriculum progression and 'connectedness' of learning	<i>'The school's curriculum planning for mathematics carefully sequences knowledge, concepts and procedures to build mathematical knowledge and skills systematically and, over time, the curriculum draws connections across different ways of looking at mathematical ideas.'</i>	<ul style="list-style-type: none"> What are the key ideas and building blocks in learning? The curriculum is mapped clearly to support transition and ensure pupils acquire knowledge and skills relevant to their year group. Over time, pupils recognise a concept, idea or technique with increasing independence in new situations and contexts. 	
Coherence: lessons characterised by key learning points	<i>'The curriculum divides new material into manageable steps lesson by lesson.'</i>	<ul style="list-style-type: none"> Carefully crafted lesson design provides a step-by-step, conceptual journey through the mathematics, engaging pupils in reasoning and the development of their mathematical thinking. 	
Mathematical thinking	<i>'The school's curriculum identifies opportunities when mathematical reasoning and solving problems will allow pupils to make useful connections between identified mathematical ideas or to anticipate practical problems they are likely to encounter in adult life. Pupils have sufficient understanding of, and unconscious competence in, pre-requisite mathematical knowledge, concepts and procedures that are necessary to succeed in the specific tasks set.'</i>	<ul style="list-style-type: none"> Teachers design: lessons that incorporate variation (ie <i>What it is</i> and <i>What it's not</i>); and tasks that enable pupils to solve problems (routine/non-routine), applying to different contexts. Pupils suggest their own examples (and non-examples) of a concept, idea or technique. 	
Mathematical fluency	<i>'Within the curriculum, there are sufficient opportunities planned to revisit previously learned knowledge, concepts and procedures; this is ensure that, once learned, mathematical knowledge becomes deeply embedded in pupils' memories. This then allows rapid and accurate recall and frees pupils' attention so they can work with increasing independence, apply their mathematical knowledge to more complex concepts and procedures, and gain enjoyment through a growing self-confidence in their ability.'</i>	<ul style="list-style-type: none"> Fluency comes from deep knowledge and regular practice (ie <i>'practice makes skilled'</i>). The principles of a 'growth mindset' support pupils' confidence of themselves as mathematicians. 	

Department for Education

Mathematics programmes of study: key stages 1 and 2

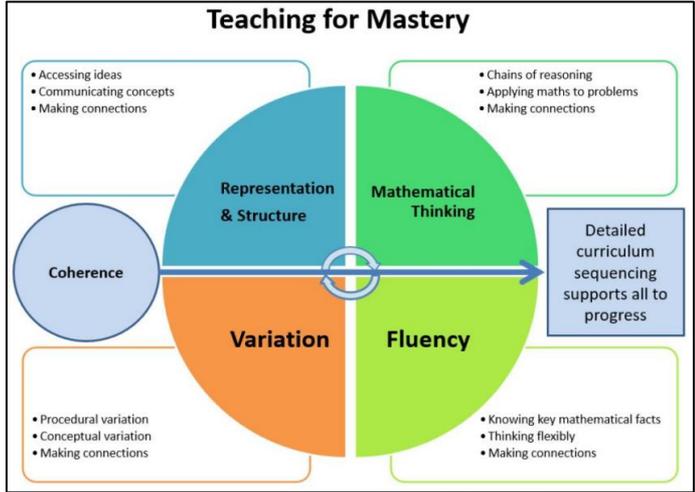
National curriculum in England

Statutory framework for the early years foundation stage

Setting the standards for learning, development and care for children from birth to five



SUPPORT FOR PRIMARY TEACHERS

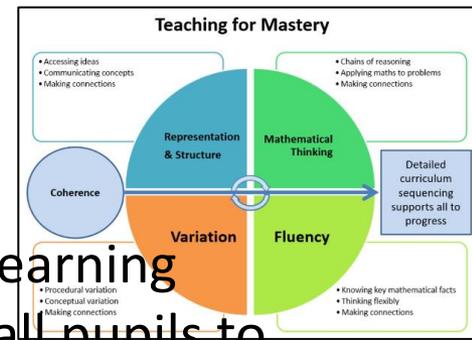


Research and analysis Research review series: mathematics

Ofsted, May 2021

'Five Big Ideas' in Teaching for Mastery

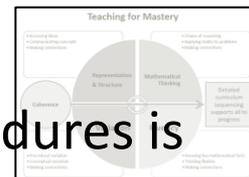
(NCETM, updated November 2022)



Coherence ... 'Teaching is designed to enable a coherent learning progression through the curriculum, providing access for all pupils to develop a deep and connected understanding of mathematics that they can apply in a range of contexts.'

Representation and Structure ... 'Teachers carefully select representations of mathematics to expose mathematical structure. The intention is to support pupils in *seeing* the mathematics, rather than using the representation as a tool to *do* the mathematics. These representations become mental images that students can use to think about mathematics, supporting them to achieve a deep understanding of mathematical structures and connections.'

Mathematical Thinking ... 'is central to how pupils learn mathematics and includes looking for patterns and relationships, making connections, conjecturing, reasoning, and generalising. Pupils should actively engage in mathematical thinking in all lessons, communicating their ideas using precise mathematical language.'



Fluency ... 'Efficient, accurate recall of key number facts and procedures is essential for fluency, freeing pupils' minds to think deeply about concepts and problems, but fluency demands more than this. It requires pupils to have the flexibility to move between different contexts and representations of mathematics, to recognise relationships and make connections, and to choose appropriate methods and strategies to solve problems.'

Variation ... 'The purpose is to draw closer attention to a key feature of a mathematical concept or structure through varying some elements while keeping others constant.'

- Conceptual variation involves varying how a concept is represented to draw attention to critical features. Often more than one representation is required to look at the concept from different perspectives and gain comprehensive knowledge.
- Procedural variation considers how the student will *proceed* through a learning sequence. Purposeful changes are made in order that pupils' attention is drawn to key features of the mathematics, scaffolding students' thinking to enable them to reason logically and make connections.'

HOW A MASTERY APPROACH IS HELPING EAL PUPILS

Related pages:

- [Four ways to create better mathematical talk in your classroom](#)
- [Curriculum prioritisation in primary maths](#)
- [Primary Mastery Professional Development](#)

'Embracing teaching for mastery has enabled EAL pupils to engage fully in maths lessons, says headteacher.' [NCETM article, April 2023]

- **A clear vision**
- **Support from the Maths Hub**
- **Systems of CPD**
- **Mathematical vocabulary**
- **Input from teaching assistants**

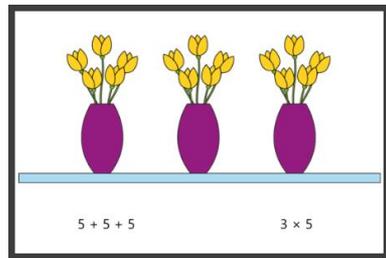
A TALE OF TWO SCHOOLS

'We visit two very different primary schools, and learn about their reasons for choosing teaching for mastery and its impact.' [NCETM article, May 2023]

Related Pages: [Teaching for Mastery](#)

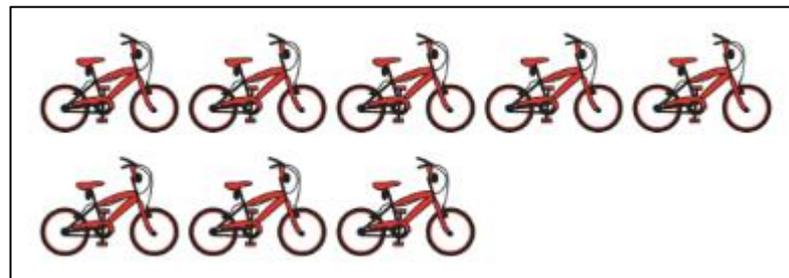
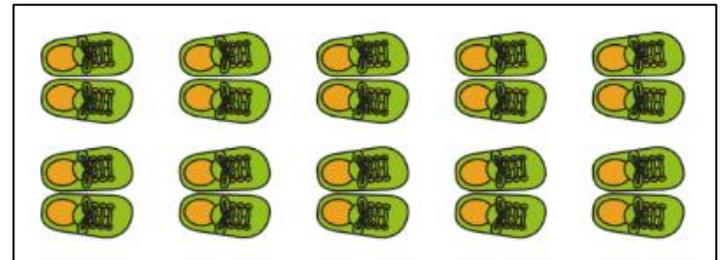
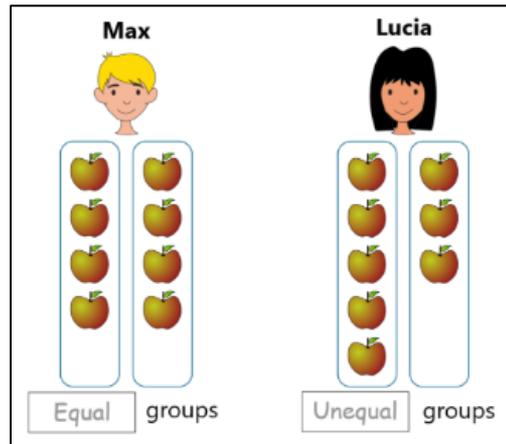
- **Usworth Colliery Primary, in the middle of an estate in Tyne and Wear, NE England; and**
- **St Thérèse of Lisieux RC Primary, on the border of North Yorkshire and the Tees Valley.**

USEFUL TIPS FOR TACKLING MULTIPLICATIVE THINKING



‘Supporting children to develop an understanding of the structures involved in multiplicative thinking is essential for so many areas of maths. But how can we ensure that teachers can develop multiplicative thinking across the primary maths curriculum?’

1. Introducing multiplicative thinking
2. What is unitising, and why is it important?
3. Representations in our primary video lessons



INTRODUCING MULTIPLICATIVE THINKING

‘Building in small steps to ensure all children develop understanding early on in primary school’

[Article, May 2022]

[Introducing Multiplicative Thinking](#) (NCETM article, May 2022)

Building in small steps to ensure all children develop understanding early on in primary school.

What does this image convey, and why is it important in maths?

The image, taken from the [NCETM Primary Mastery Professional Development materials](#), is one of a series of representations built to support children in the conceptual shift from additive thinking to multiplicative thinking.

The first expression ‘ $2 + 2 + 2 + 2$ ’ represents the additive relationship that children become familiar within the first few years in school.

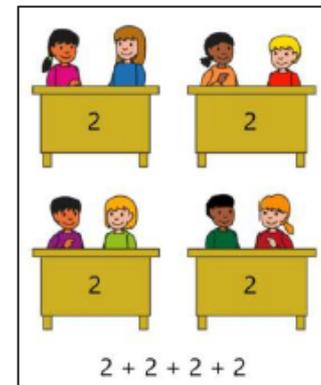
‘ 4×2 ’ represents the multiplicative relationship – 4 groups of 2 children.

This shift is one of the hurdles where children can get ‘stuck’ in their mathematical learning.

In a 2018 [paper](#), two influential maths education researchers suggest: *‘It is likely that the concept of addition is closely related to an inborn primitive conception, (and that) the concept of multiplication is not.’*

If multiplicative understanding is not embedded, then progress in maths will be limited. A significant amount of maths in KS2 and beyond depends on the ability to think and reason multiplicatively. For example: fractions; ratio; percentages; trigonometry; similarity; and pie charts etc.

Any secondary teacher will tell you that even older students often think additively by default. In many contexts if you ask a student about the relationship between two numbers, they will often look first at the difference, even where the relative proportions are more relevant. For example, here is a classic mistake in equivalent fractions, made by looking at additive relationships rather than multiplicative:



$$\frac{4}{10} = \frac{6}{12} \quad \text{X}$$

Maths Fluency sessions materials

Example session - Year 5 Spring term



Maths Fluency Materials

Example session
Year 5 Spring

05:37

Example session - Year 1 Autumn



Maths Fluency Materials

Example session
Year 1 Autumn

04:54

The HFL Education annual Year 5 Mathematics Challenge

<https://www.hertsforlearning.co.uk/about-us/who-we-are>

HFL 'Maths Fluency' resources

- Regular fluency sessions.
- Supports pupils to **'retrieve, rehearse and embed learning'** (previously taught) 'but needs the opportunity to be secured'.
- Designed to be 10-15 mins, covering several areas of maths
- 18 teacher PowerPoints (3 per year group, Y1-Y6 aut/spr/sum); guidance document (lists concepts/slides for each year group for each term); and staff development section ('launch' ppt for staff CPD, includes 'model' session to provide staff with an insight into pace and style).

Vocabulary and sentence stems are designed to guide and support pupils to articulate responses precisely and accurately.

- What is in the suite of materials
- What leaders need to consider before any launch / implementation begins
- How to launch and implement this within a school setting
- Considerations for leaders around embedding, monitoring, supporting and analysing impact

Schools will need to consider:

- When the training development session will be and who will lead it
- How will the materials be disseminated e.g. available on the shared drive and modelled at the staff development session?
- Would it help to try it out in your own class first?
- Whole school vs smaller trial – do you want everyone to get started straight away or will a few classes / year groups begin first

When watching a fluency session being led by a colleague it may be helpful to focus on:

- Are all the pupils engaged? Are they joining in in a range of ways, such as through talk partners, saying answers together or using small whiteboards?
- Does the pace of the session allow for 3-5 areas of maths to be covered within the short (10 – 15 minutes) session?
- Does the questioning by the teacher allow pupils to retrieve, rehearse and secure key learning that the pupils should already have?
- Can you tell that small adaptations are being made day-on-day until the area is very familiar and has been thoroughly explored.

Reasoning Prompts

Change the values to balance the number sentence.

Give me an example of ...
(and another ... and another).

Spot, and correct, the mistake.

What do you notice?

Which one is the odd one out?
Explain your reasoning

Always, sometimes or
never true ... and explain.

Use ... to solve/calculate ...

True or false ... and explain.

Convince me that ...

If you know ..., what else do you know?

2023 KS1 ARITHMETIC

$79 - 6 = \boxed{}$

$35 + 5 + 5 = \boxed{}$

$13 - 7 = \boxed{}$

$11 + \boxed{} = 77$

$\boxed{} - 5 = 3$

$41 - 15 = \boxed{}$

$14 + 77 = \boxed{}$

$9 + 32 = \boxed{}$

$11 \times 2 = \boxed{}$

$24 \div 2 = \boxed{}$

2023 KS1 REASONING

Sita Amy

Ben has 26 cards.

Sita has 32 cards.

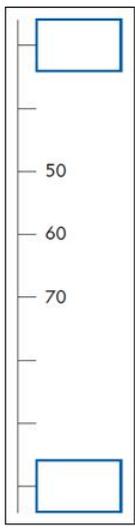
$7 + 3 = 10$
 $17 + 3 = 20$
 $\boxed{} + 3 = 30$
 $\boxed{} + 3 = \boxed{}$
 $47 + 3 = 50$

$3 \boxed{} + \boxed{} 2 = 50$

5	13
7	11
4	15
9	16

This is Ben's money.

This is Sita's money.



Amy makes **24** sandwiches for a party.
9 children come to the party.
 Each child eats **2** sandwiches.

These marbles are sorted into groups.

2023 KS2 ARITHMETIC

$95\% \text{ of } 180 =$

$2,800 \div 7 =$

$0.3 \div 10 =$

$450 \div 9 =$

$29.5 - 16.125 =$

$\frac{1}{8} \div 3 =$

$3.2 \times 12 =$

$52\% \text{ of } 700 =$

$\frac{1}{3} \div 6 =$

$2,700 \div 3 =$

$4 \times 702 =$

$2 \times 4 \times 30 =$

$1 + \frac{2}{7} + \frac{5}{7} =$

$38\% \text{ of } 750 =$

$\frac{2}{3} \times 900 =$

$0.4 \times 37 =$

2023 KS2 REASONING

This formula is used to estimate the mass (in kilograms) of young children.

$$\text{mass} = 2 \times (\text{age in years} + 5)$$

Some children choose their favourite zoo animal.

The pictogram shows the results.

Animal	Number of children
--------	--------------------

6°C -4°C 1°C -10°C 3°C

$\frac{1}{5}$ of a number is 22

The manager of a flower shop orders 4 boxes

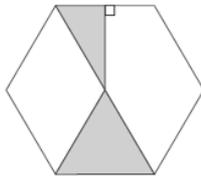
There are 50 roses in each box.

The manager makes bunches with 6 roses in

$754 \times 6 + 754 \times 3 = 754 \times \boxed{}$

Here is a regular hexagon.

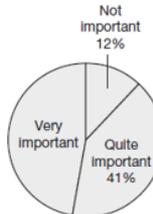
The area of the large shaded triangle is double the area of the small shaded triangle.



1,200 pupils were asked this question:

How important is it to have a break when using a screen?

This chart shows the results.



$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$
3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5
6	$6\frac{1}{2}$	7	$7\frac{1}{2}$	
9	$9\frac{1}{2}$	10		
		12	$12\frac{1}{2}$	



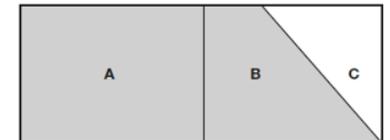
Mushrooms
£3.20 for 1 kg



Carrots
60p for 1 kg

A box of 24 chocolate eggs has a mass of 870 grams.

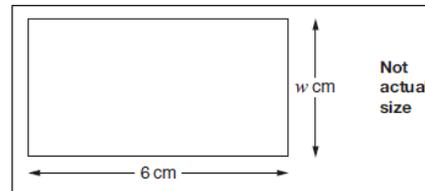
The empty box has a mass of 30 grams.



Not to scale

Part A is $\frac{1}{2}$ of the area of the rectangle.

Part B is $\frac{1}{3}$ of the area of the rectangle.





Episode 16: High quality talk

Evidence into Action

In this instalment, host **Alex Quigley** is joined by co-host, **Kirstin Mulholland**, EEF associate for content and engagement, with particular interest in mathematics.

Expert guests take part in discussions including:

- **Professor Neil Mercer**, Director of Oracy at the **University of Cambridge**;
- **Mrs Nicola Hemming**, DHT at **Clifton Primary, Birmingham**; and
- **Simon Cox**, Leader at **Blackpool Research School**.

They discuss high quality talk and how it can be applied and developed in classrooms.

**THE USE OF 'BAR MODELLING' AS A
REPRESENTATION TO SUPPORT TEACHING
AND TO HELP PUPILS UNDERSTAND
MATHEMATICAL STRUCTURE.**

**FLORA TURNER (MATHEMATICS SUBJECT LEADER,
WINCHCOMBE ABBEY C of E PRIMARY ACADEMY)**

Subject leaders will:

- understand the rationale underpinning an identified area for improvement
- learn about the process of leading, monitoring and evaluating an aspect of curriculum development;
- gain an insight into practical approaches to effect change; and
- reflect on implications for their own setting.