Hampshire Services
HIAS SCHOOL IMPROVEMENT

HIAS MOODLE+ RESOURCE

Mental Fluency Progression

Key Stage 2

HIAS Maths Team
June 2020
Final version

Hampshire County Council

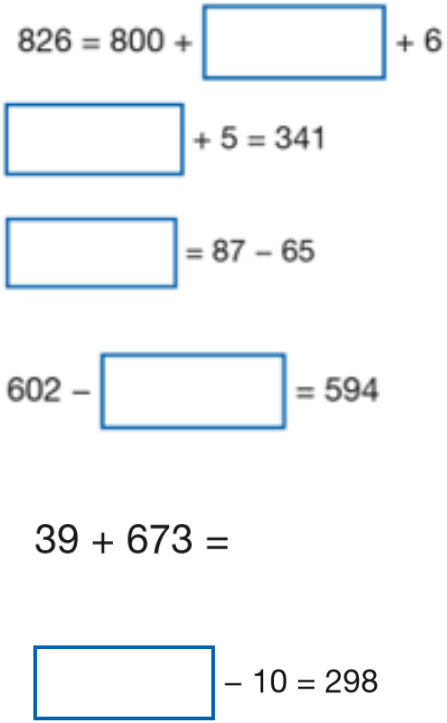
www.hants.gov.uk

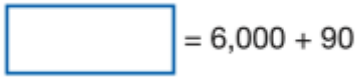
Overview

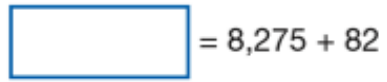
This document contains guidance on the development of mental fluency with calculation across KS2 and follows on from "Mental Fluency at KS1".

Points to consider when using this resource

This document is to support teachers with Assessment for Learning and focusing attention on their planning and formative assessment judgements. It is not intended to be used as a test. The examples of SATs questions illustrate the type of calculation pupils should be able to tackle confidently using mental methods – sometimes with jottings – if they have the underlying understanding of the core structures and relationships within the calculation.

Addition and subtraction		
From Year 3:		
Mental fluency Expectation	**National Curriculum Programme of Study**	**Year 6 SATs question examples**
Apply all mental strategies to addition and subtraction within whole numbers up to 1000, including • Using known facts and related facts • Rounding and adjusting • Using doubles / halves / near doubles • Partitioning and recombining • Using approximation to estimate an answer Apply known facts and understanding of unit and non-unit fractions to add and subtract fractions with the same denominator	Recall and use addition and subtraction facts to 20 fluently and derive and use related facts up to 100 (Year 2) Add and subtract numbers [ ] mentally, including • A two-digit number and ones • A two-digit number and tens • Two two-digit number • Adding three one-digit numbers (Year 2) Add and subtract • A three-digit number and ones • A three-digit number and tens • A three-digit number and hundreds (Year 3) Estimate the answer to a calculation and use inverse operations to check answers (Year 3)	

	Solve problems, including missing number problems, using number facts [and] place value (Year 3) Add and subtract fractions with the same denominator within one whole	
From Year 4:		
Apply all mental strategies to addition and subtraction using 4-digit whole numbers, including • Using known facts and related facts • Rounding and adjusting • Using doubles / halves / near doubles • Partitioning and recombining • Using approximation to estimate an answer Use understanding of fractions to add fractions with the same denominator Use understanding of place value in decimals, and simple fraction / decimal equivalents to add and subtract some decimals	Find 1000 more or less than a given number (Year 4) Estimate and use inverse operations to check answers to calculations (Year 4) Practise mental methods with increasingly large numbers to aid fluency (Year 4 non-statutory guidance) Add and subtract fractions with the same denominator (Year 4) Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and dividing one-digit numbers or quantities by 10 (Year 3)	

	Count up and down in hundredths; recognise that hundredths arise when dividing an object by 100 and dividing tenths by 10 (Year 4) Recognise and write decimal equivalents to ¼, ½, ¾ (Year 4)	 $7{,}064 - 502 =$ $\frac{9}{11} - \frac{4}{11} =$ $7 - 2.25 =$ $9 - 1.9 =$ $10 - 5.4 =$

From Year 5:		
Apply all mental strategies to addition and subtraction of whole numbers with more than 4 digits, including • Using known facts and related facts • Rounding and adjusting • Using doubles / halves / near doubles • Partitioning and recombining • Using approximation to estimate an answer Use knowledge of common factors and multiples to support the addition and subtraction of fractions with different denominators. This includes calculations that exceed 1 as a mixed number.	Add and subtract numbers mentally with increasingly large numbers (Year 5) Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy (Year 4) Add and subtract fractions with the same denominator and denominators that are multiples of the same number (Year 5). [Pupils] mentally add and subtract tenths, and one-digit whole numbers and tenths (Year 5 non-statutory guidance). [Pupils] practices adding and subtracting decimals, including a mix of whole numbers and decimals, with different numbers of decimal places and complements of 1 (Year 5 non-statutory guidance).	$\frac{1}{5} + \frac{3}{4} =$ $1\frac{1}{5} + 2\frac{1}{10} =$ $\frac{8}{9} - \frac{1}{4} =$ $1\frac{3}{7} - \frac{4}{7} =$ $2\frac{1}{2} - \frac{3}{4} =$ $5.87 + 3.123 =$

From Year 6:		
Pupils now apply all mental strategies to addition and subtraction with increasingly large numbers, including decimals and fractions.	[Pupils] undertake mental calculations with increasingly large numbers and more complex calculations (Year 6 non-statutory guidance). Use estimations to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. Pupils round answers to a specified degree of accuracy (Year 6 non-statutory guidance). Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions (Year 6).	3,050,020 = 3,000,000 + ☐ + 20 37.8 – 14.671 =

Multiplication and Division		
From Year 3:		
Pupils should be fluent with multiplication facts for the 2, 3, 4, 5, 8 and 10 times tables They should be able to use these to recall the related division facts. They should also be able to begin to apply these, along with their understanding of commutativity and associativity, to working out mentally some 2-digit x 1- digit numbers.	Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables (Year 2) Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables (Year 3). Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including two-digit numbers times one-digit numbers, using mental [] methods (Year 3). Pupils develop efficient mental methods, for example using commutativity and associativity and multiplication and division facts to derive related facts (Year 3 non-statutory guidance).	$2 \times 45 =$ $180 \div 3 =$ $120 \div 12 =$ $213 \times 0 =$ $60 \div 15 =$

From Year 4:		
Pupils should now be fluent with all multiplication and division facts up to 12 x 12, and be able to use a range of mental strategies to solve some calculations involving larger numbers. They should also be able to use multiplication facts to solve some problems involving known decimals. -	Recall multiplication and division facts for multiplication tables up to 12 x 12 (Year 4) Use place value, known and derived facts to multiply and divide mentally, including multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers (Year 4) Recognise and use factor pairs and commutativity in mental calculations (Year 4 non-statutory guidance) Pupils practise mental methods and extend this to three-digit numbers to derive facts (Year 4).	$99 \div 11 =$ $270 \div 3 =$ $120 \div 12 =$ $1{,}210 \div 11 =$ $\frac{3}{4}$ of $1{,}000 =$ $5 \times 4 \times 10 =$ $5{,}400 \div 9 =$ $0.5 \times 28 =$

From Year 5:		
Pupils secure understanding of place value, and scaling up or down by a scale factor of ten, should enable pupils to accurately multiply and divide numbers by 10, 100, 1000. Pupils continue to apply their quick recall of all multiplication facts to derive related facts and to solve multiplication and division calculations, inlcuding those involving fractions. Pupis can use their recall of multiplication table facts to work out square and cube numbers.	Multiply and divide numbers mentally drawing upon known facts .(Year 5) Recall prime numbers up to 19 (Year 5). Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 (Year 5). Recognise and use square numbers and cube numbers, and the notation for square and cubed Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams (Year 5).	$1{,}210 \div 11 =$ $3^3 =$ $101 \times 1{,}000 =$ $6^2 + 10 =$ $1\frac{3}{4} \times 10 =$ $0.1 \div 100 =$

From Year 6:		
Pupils continue to apply their mental skills and strategies to increasingly large numbers and also to decimals and fractions.	[Pupils] undertake mental calculations with increasingly large numbers and more complex calculations (Year 6) Pupils continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency (Year 6) Multiply simple pairs of proper fractions, writing the answer in its simplest form (Year 6). Divide proper fractions by whole numbers (Year 6). Multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places (Year 6). Recall and use equivalences between simple fractions, decimals and percentages (Year 6) Pupils develop their skills of rounding and estimating as a means of predicting and checking the order of magnistude of their answers to decimal calculations (Year 6 non-statutory guidance).	¼ x ½ = 1/8 1/3 ÷ 2 = 1/6 $\frac{4}{5} \div 4 =$

Percentages		
Year 5:		
Pupils understanding of percentages enables them to use their known facts and mental strategies to work out percentages such as 1%, 10%, 25% of an amount.	Solve problems which require knowing percentage equivalents of ½, ¼, 1/5, 2/5, 4/5 and those fractions with a denominator of a multiple of 10 or 25	20% of 3,000 = 35% of 320 = 51% of 900 = 20% of 1,200 = 99% of 200 =

x	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3		9	12	15	18	21	24	27	30	33	36
4			16	20	24	28	32	36	40	44	48
5				25	30	35	40	45	50	55	60
6					36	42	48	54	60	66	72
7						49	56	63	70	77	84
8							64	72	80	88	96
9								81	90	99	108
10									100	110	120
11										121	132
12											144

National Curriculum progression in conceptual understanding leading to fluency in recall of all multiplication facts by the end

28 multiplication/division facts to learn in year 2 (x2, x5, x10)

+21 multiplication/division facts to learn in year 3 (x3, x4, x8)

+16 multiplication/division facts to learn in year 4 (x6, x7, x9, x11,x12)

HIAS Maths Team

Jo Lees – Area Inspector
Email: jo.lees@hants.gov.uk

Jacqui Clifft – Area Inspector
Email: jacqui.clifft@hants.gov.uk

Jenny Burn – Inspector/Adviser
Email: jenny.burn@hants.gov.uk

Tessa Ingrey – Teaching & Learning Adviser (P/T)
Email: tessa.ingrey@hants.gov.uk

Natalie Ivey – Inspector/Adviser (P/T)
Email: natalie.ivey@hants.gov.uk

Dave Parnell – Teaching & Learning Adviser
Email: dave.parnell@hants.gov.uk

Rebecca Vickers – Teaching & Learning Adviser
Email: rebecca.vickers@hants.gov.uk

Brenda Robertson – Inspector/Adviser
Email: brenda.robertson2@hants.gov.uk

Kate Spencer – Teaching & Learning Adviser
Email: kathryn.spencer@hants.gov.uk

For further details on the full range of services available please contact us using the following details:

Tel: 01962 874820 or email: hias.enquiries@hants.gov.uk

Upcoming Courses

Keep up-to-date with our learning opportunities for each subject through our Upcoming Course pages linked below. To browse the full catalogue of learning offers, visit our new Learning Zone. Full details of how to access the site to make a booking are provided here.

- English
- Maths
- Science
- Geography
- RE
- History
- Leadership
- Computing
- Art
- D&T
- Assessment
- Support Staff
- SEN

Terms and conditions

Terms of licence

Moodle+ subscribers are licenced to access and use this resource and have agreed to pay the annual subscription fee. This authority starts when the fee is paid and ends when the subscription period expired unless it is renewed. This file is for personal or classroom use only. By using it, you agree that you will not copy or reproduce this file except for your own personal, non-commercial use. HIAS have the right to modify the terms of this agreement at any time; the modification will be effective immediately and shall replace all prior agreements.

You are welcome to:

- download this resource
- save this resource on your computer
- print as many copies as you would like to use in your school
- amend this electronic resource so long as you acknowledge its source and do not share as your own work.

You may not:

- claim this resource as your own
- sell or in any way profit from this resource
- store or distribute this resource on any other website or another location where others are able to electronically retrieve it
- email this resource to anyone outside your school or transmit it in any other fashion.