The Three Strands of MAP

Navigating Mental Mathematics

The Three Key Strands of MAP:

1. Counting Skills
2. Learning Number Facts
3. Mental Calculation Strategies

If children are given the opportunity to have regular (daily if possible) practise in all three of these areas over the course of the year, their number knowledge and number sense will greatly improve, and their mathematical confidence should significantly increase.

The reason for these being the main strands of MAP are as follows: -

Counting:

1.1 Why is counting so important?

Counting skills are extremely important for many strands of mathematics, giving children:

- Confidence in developing number names in a range of different sequences
- Early knowledge of the steps involved in learning their times tables.
- Clear support in answering almost any addition or subtraction calculation

1.2 The Counting Progression Overview has several key aims:

- To ensure that children can count on or back in ones from any number
- To give children real confidence in counting on or back in the regular steps (2s, 3s, 4s etc.) up to and beyond the 12th multiple (which will be very beneficial to their ability to then learn tables facts)
- To support children in counting on or back in any step from any starting point

  (E.g. Counting in 5s, but starting at 3, counting in 7s, but starting at 45, counting back in 3s but starting at 50 etc.)
- To learn the order of other significant number sequences such as squares, primes and cubes

Each of these objectives will ensure that children become increasingly confident in seeing, hearing and saying number sequences, enabling them to spot a number pattern and continue any simple given sequence indefinitely.

1.3 The MAP Digital Resource Bank:

- Counting activities and instructions
- Counting games (including templates and downloadable resources)
- Counting songs from the Number Fun Portal songs
- Counting resource advice
- Video clips of counting activities in action

The Counting Progression Overview outlines the key counting steps that children need to practice in each year group. It is crucial, however, that all counting steps from previous years continue to be practised.

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Counting Progression Overview

Note: This is a general guide to age-related expectations for counting. Please also continue to practise counting from previous year groups.

Year Group	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Counting On & Back in 1s from zero or 1	1s to 20 (and beyond) *	1s to 100 (and beyond) *		*"Using a variety of representations, including those related to measure, pupils continue to count in ones, tens and hundreds, so that they become fluent in the order and place value of numbers to 1000." NSG*			
Counting On & Back in 1s from any number	From any 1-digit number	From any 2-digit number *	From any 3-digit number	From any 4-digit number	Backwards across zero to include negative numbers *	Forwards & backwards within positive & negative integers, including across zero *	
Counting On & Back in regular multiples from zero		2s to 24 * 5s to 60 * 10s to 120 *	3s to 36 * 11s to 132 2s beyond 24 5s beyond 60 10s beyond 120	4s to 48 * (Y2?) 8s to 96 * 12s to 144 50s to 1,000 * 100s to 1,000 * 3s beyond 36 4s beyond 48 11s beyond 132	6s to 72 * (Y3?) 7s to 84 * (Y3?) 9s to 108 * (Y3?) 25s to 1,000 * 1,000s to 20,000 * 6s beyond 72 7s beyond 84 8s beyond 96 9s beyond 108 12s beyond 144	10,000s & 100,000s to 1,000,000 Powers of 10 of any given number up to 1,000,000. E.g. Multiples of 20, 200, 2,000 etc. *	15s to 180
Counting On & Back in multiples from any number			2s & 5s from any 2-digit number 10s from any 2-digit number *	2s, 5s and 10s from any 3-digit number	3s, 4s, 8s and 11s from any starting point 50s & 100s from any starting point	6s, 7s, 9s and 12s from any starting point Multiples of 10, 25, 500, 100, 1,000 etc. from any starting point	Multiples of 20, 30, 40, 50, 60, 70, 80, 90, 110, 120, 250 & 500 from any starting point
Counting On & Back in fractions from zero			Halves Quarters (Up to 20th multiple) *"Pupils should count in fractions up to 10, starting from any number." NSG*	Tenths * Thirds (Up to 20th multiple)	Fifths Eighths Hundredths * (Up to 20th multiple) *"They practise counting using simple fractions and decimals, both forwards and backwards." NSG*	Sixths, Sevenths Ninths, Elevenths Twelfths (Up to 20th multiple) 0.1s, 0.2s…1.2s in sequence from zero.	0.1s, 0.2s…1.2s in from any starting point.
Counting other counts					Negative Numbers	Squares Roman Numerals	Primes & Cubes

M.A.P. Counting Progression Overview: numberfun.com/reddymademaths.co.uk

* = stated EYFS & National Curriculum Objectives

Number Facts:

1.1 Why are Number Facts so important?

- In the UK many people still have a reliance on using fingers as a means to answer simple addition and subtraction questions.
- Both children (and many adults) often resort to their fingers for calculations such as 8 + 6, 29 + 7 or 55 + 8 (questions from the Year 1 & 2 curriculum).
- This can continue into later years, even by people achieving high grades in maths, where fingers are still relied upon, mainly as a ‘security blanket’ for confidence.

As the OFSTED research review for mathematics outlines, the more number facts that children have at their disposal, the more their general maths confidence will increase.

This process of building up their declarative knowledge (‘I know that…’) so that they can ‘declare’ number facts instantly is known as ‘automaticity’.

Developing automaticity in knowing and recalling number facts is extremely important for the overall development, not just of mental maths but mathematics in general. It means ...

- Children no longer need fingers or resources once they can recall number facts automatically.
- All children are able to ‘declare’ what they know quickly and confidently
- Pupils’ working memory is freed to actually calculate rather than worrying about how to work out key facts
- Having a bank of maths facts supports their progression in both mental and written arithmetic

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Through MAP, the aim is that using fingers and resources is replaced by knowledge of facts so that children are secure that they can answer simple calculations mentally.

The Mental Strategies VCP (see Section 3) does provide clear examples of mental methods, often aligned to visual imagery, which will become part of a child's calculation repertoire. It is even more valuable, however, if key facts have been committed to memory. These can then be recalled with confidence whenever needed.

1.2 Learning Facts Progression Overview for Number

has a series of specific facts which are crucial to learn: -

- **Number bonds to 10 and 20, alongside number complements to 100 and decimal complements to 1**
- **Addition and subtraction facts for all numbers to 20**
- **Linked 'Because I Know…' facts involving multiples of 10, 100, 1000 and decimal facts**
- **Odds and even numbers**
- **Doubles and halves of 2 digit numbers and key 3 / 4 digit numbers**
- **Times tables facts – both multiplication and division**
- **Factor pairs**
- **Squares to 12 squared**
- **Fraction / decimal / percentage equivalences**

Learning Facts Progression - Number:

Blue = Non-Negotiable
Red = Top Target

Year Group	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Number Bonds/ Complements	Addition and Subtraction Facts for numbers 1 to 5 (e.g. 2+1, 3+2, 5 – 3 etc.)	Instant recall of all number bonds to 10 (e.g. 6+4, 2+8) Practise recall of all number facts within 10 (e.g. 6+3, 9-7)	Instant recall of all number bonds to 20 (e.g. 6+14, 13+7) Instant recall of all number complements to 100 using multiples of 10 (e.g. 60+40) Practise recall of all number facts within 20 (E.g. 7+5, 13-8)	Pairs of 2-digit numbers with a total of 100 (E.g. 68+32) Complements to 1000 with multiples of 100 (E.g. 700+300) Instant recall of all number facts within 20 (E.g. Facts for 13 - 19)	Revise sums and differences of pairs of multiples of 10, 100 or 1000 (E.g. Complements to 1000 / 10,000 etc.)	Decimal complements to 1 – 2 d.p. (E.g. 0.76 + 0.24) Decimal complements to 10 – 1 d.p. (E.g. 6.2 + 3.8)	Decimal complements for all whole numbers to 10 – 2 d.p. (E.g. 7.26 + 0.74 = 8)
Additional Number Facts	One more / less than any 1-digit number	One more / less than any 2-digit number Ten more / less than any 2-digit number	What must be added to any 2-digit number to make the next multiple of 10 (E.g. 52 + ___ = 60)		What must be added to any 3-digit number to make the next multiple of 100 (E.g. 521 + ___ = 600)	What must be added to any four-digit number to make the next multiple of 1000 (E.g. 4087 + ___ = 5000) What must be added to a decimal with units and tenths to make the next whole number (E.g. 4.8 + ___ = 5)	
Doubles and Halves	Double 1 to double 5	All doubles and halves from double 1 to double 10 / half of 2 to half of 20	All doubles and halves from double 1 to double 20 / half of 2 to half of 40 (E.g. double 17=34, half of 28 = 14)	Doubles of all numbers to 100 with ones digits 5 or less, and corresponding halves (E.g. Double 43, double 72, half of 46) Reinforce doubles & halves of all multiples of 10 & 100 (E.g. double 3 800, half of 140)	Addition doubles of numbers 1 to 100 (E.g. 38 + 38, 76 + 76) and their corresponding halves Revise doubles of multiples of 10 and 100 and corresponding Doubles	Doubles and halves of decimals to 10 – 1 d.p. (E.g. double 3.4, half of 5.6)	Doubles and halves of decimals to 100 – 2 d.p. (E.g. double 18.45, half of 6.48)
Table Facts			Recall of 2, 5 and 10 times tables	Recall of 2, 3, 4, 5, 8, 10 and 11 times tables	Recall of multiplication facts to 12 x 12 and the corresponding division facts (i.e. 6, 7, 9 and 12 times tables)	Squares to 12 x 12 Multiples of 10 tables facts (E.g. 20 / 40 / 60 / 80 etc. tables)	Cubes to 10 x 10 x 10
Fractions, Decimals & Percentages				Reading any unit or non-unit fraction less than one (E.g. 1/7, 3/12, 4/9) Fraction / decimal equivalences for halves and tenths.	Pairs of fractions that total 1 Decimal complements to 1 – 1 d.p. (E.g. 0.3 + 0.7) Fraction and decimal equivalents of one-half, quarters, tenths and hundredths (E.g. 3/10 is 0.3, 3/100 is 0.03 and ¼ is 0.25)	Fraction, decimal and percentage equivalents of halves, quarters, tenths, hundredths, thirds and fifths (E.g. 3/10 is 0.3, 3/100 is 0.03 and ¼ is 0.25 Find instant fraction of numbers and amounts using tables knowledge (E.g. 1/9 of 63 = 7, 2/3 of 27 = 18, 5/6 of 24 = 20)	Equivalent fractions, decimals & percentages for a half, quarters, thirds, fifths, tenths, hundredths, sixths and eighths (plus ninths and elevenths if possible) Find instant percentages of numbers and amounts using tables knowledge (E.g. 70% of 40 = 28, 60% of 80 = 48, 75% of 32 = 24)
Properties of Number		Recognise odd and even numbers to 20	Recognise odd and even numbers to 100	Recognise any odd and even number	Factor pairs for known multiplication facts	Factor pairs for numbers to 100 Prime numbers to 20	Prime numbers up to 100 Prime factors of numbers to 100

M.A.P. Learning Facts Progression Overview: numberfun.com/reddymademaths.co.uk

* = stated EYFS & National Curriculum Objectives

Number Facts: (continued)

1.3 MAP Digital Resource Bank

includes a wide range of

- Engaging activities to practice factual recall
- Number facts games (including instructions, templates, Gameboards, example games, video instruction clips and downloadable resources)
- Number facts songs and characters (including Farmer Pete and Number Bond 006/004 from the Number Fun Portal)
- Advice on additional resources which will aid the learning of number facts
- Video clips of children learning / practising number facts, using MAP ideas.

In addition, it is imperative that some key facts are regularly 'tested' (especially tables) to make sure that they are retained long term. MAP also provides: -

- Speed grids to support testing of totals, differences, multiplication and division facts, and finding fractions and percentages
- Number Fun 'Accelerator Challenges' for a wide range of key facts which need to be learned and practised.

In the NNS, recall of facts (along with counting) was covered by the daily mental and oral starter, giving all children regular practice of designated objectives over half termly blocks.

MAP provides a clear set of facts which need to be learnt but allows staff to determine the order in which they are taught, and the length of time needed to cover them.

The Learning Facts Progression Overview for Number outlines the key number facts that children need to learn automatically in each year group (and in certain cases how to use them to support other learning:

- E.g. 1. Using number bonds to 9 and 10 in order to make any pair of numbers total 100.
- E.g. 2. Using times tables facts to support finding fractions and/or percentages of amounts

It is crucial, however, that all facts from previous years continue to be practised regularly.

MAP also includes a Learning Facts Progression Overview for Measures & Geometry,

which provides expectations and also key definitions for children to learn.

Although MAP is predominantly a mental mathematics policy, this overview has been included as children also need to be able to quickly convert measurements mentally.

Being able to instantly recall facts such as 100cm = 1 metre or 1000g = 1 kilogram is crucial in enabling children to mentally work with measurements and fractions.

These are also facts that should just be 'known' as part of general knowledge, as they support life skills and link to subjects such as DT, PE and science.

The definitions, formulae and facts linked to 2-D & 3-D Shape do not need to be practised as part of MAP, but they fit the general principles of the policy so have been included to support staff in the key factual learning for this strand.

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Mental Calculation Strategies:

3.1 Why is Mental Calculation so important?

As mentioned in the overview, mental arithmetic is the most significant element of MAP and, as such, will require the greatest amount of teaching time (and the largest amount of supporting materials and guidance) within MAP sessions.

- In the early 2000s mental calculation was a key focus of the National Numeracy Strategy, and was practised each week.
- Since the introduction of the current mathematics curriculum there has been very little focus on this area, and consequently there has been a perceived decline in children's mental calculation skills.
- When given a calculation which would previously have been tackled mentally by most children (E.g. 456 + 298 or 250 + 270), the default method now seems to be a standard column procedure.

NNS – Teaching Calculation Mentally

Mental calculation is one of those aspects of learning where – if you don't use it you will end up losing it!

- Commit regular time to teaching mental calculation strategies
- Provide practice time with frequent opportunities for children to use one or more facts that they already know to work out more facts
- Introduce practical approaches and jottings with models and images children can use to carry out calculations as they secure mental strategies.
- Engage children in discussion when they explain their methods and strategies to you and their peers.

A key feature of mental arithmetic is that calculations can be worked out successfully in several different ways. Which method is the best will depend on the numbers involved, the age of the children and the range of methods that they are confident with.

For example, when asked to calculate 25 + 29, each of these strategies is equally as valid: -

- A near double: 25 + 25 = 50, 50 + 4 = 54
- Partitioning both numbers: 20 + 20 = 40, 5 + 9 = 14, 40 + 14 = 54
- Counting on from the largest number: 29 + 20 = 49, 49 + 5 = 54
- Rounding the 29 to 30 then subtracting the 1: 25 + 30 = 55, 55 – 1 = 54
- Making an easier calculation by passing 1 from 25 to 29: 25 + 29 = 24 + 30 = 54

Unlike a written (column) method, which is always done the same way, no matter which numbers are being calculated, mental arithmetic allows for choice and efficiency.

Teaching mental arithmetic strategies means that the following calculations, all of which involve subtracting from 72, could be approached in completely different ways. This will, of course, depend on the number facts that children can recall instantly and the different strategies that they have been taught regularly.

72 – 5 72 – 52 72 – 43 72 – 68 72 – 20 72 – 45 72 – 29 72 – 76

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We expect children to do these kinds of calculation mentally, applying strategies to reflect their confidence with and understanding of the alternative approaches. The clear advantages are that children develop a much stronger ‘number sense’, better understanding of place value and more confidence with numbers and the number system

To help children to learn and draw on a range of mental methods, you need to raise their awareness and understanding of the range of possible strategies, develop their confidence and fluency by practising using the strategies, and help them to choose from the range the most efficient method for a given calculation.

Number Fun Mental Calculation Policies:

Detailed progressions for mental strategies across all four operations. Check out the numberfun.com for details of the full suite of visual policies, including the Written Strategies Visual Calculation Policy.

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The underlying teaching principle here is to

Encourage children to make jottings as they work and to recognise how these can support their thinking; model this process for them and distinguish between a presentation and a jotting.

There are 6 key mental strategies (often accompanied by jottings) that can be used for each of the four operations, and children will need to learn and practice these throughout their time in school.

- In Key Stage 1 the focus will mainly be on addition and subtraction strategies.
- In Lower Key Stage 2 these strategies will be consolidated and deepened, and they will be introduced to the initial multiplication and division approaches to mental maths.
- In Upper Key Stage 2 addition and subtraction strategies are extended into decimal calculations and a much greater emphasis is placed on multiplication and division strategies.

By the time children leave school they should have a well-practised and rehearsed repertoire of strategies for all four operations, and will know when to use these in preference to standard methods.

Mental calculations involve visualising, imagining and working things out in your head. In German there is a word for it (but there is no direct equivalent in English): Gedankenexperimente, thought experiments, which involve exploring ideas in one's imagination. But children will not be able to visualise and 'see' how something works if they have not had any practical experiences to draw on or been shown any models and images that support the approaches taught.

The underlying teaching principle here is to provide suitable equipment for children to manipulate and explore how and why a calculation strategy works, and that helps them to describe and visualise or 'see' the method working.

Giving children carefully structured learning experiences with supporting discussion to describe and refine ideas and thinking will help them develop these visualisation skills.