Maths Key Objectives

What are Key Objectives?

Most mathematical understanding and procedural fluency builds on previous learning. For example, if a child does not know and understand number bonds to ten by the end of year 1 most of the Year 2 curriculum will be very difficult to access. Therefore knowledge of number bonds to ten could be considered to be an essential pre-requisite to subsequent learning. This is what we mean by a **Key Objective**. We have updated the Key objectives in Autumn 2020 so that they are aligned to the DfE/NCETM's "Ready to Progress" criteria.

What are not Key Objectives?

Some mathematical learning does not have as much of an impact on future achievement. For example, in Year 1 children have to be able to know the values of coins and notes. If children do not know this, it will not particularly hinder their progress in any area other than working with money. Therefore, we would not consider this to be a Key Objective from the Year 1 curriculum.

Where did the Key Objectives come from?

Teachers used the National Curriculum Objectives, the Lancashire KLIPs (Key Learning Indicators of Performance) and their own professional judgements to select which objectives they considered to be "Key". The Maths leader referred to the Hamilton Trust's "Key skills to go to the wall for" and a plethora of research undertaken in his Master's Thesis on the Assessment of Mathematics.

Why are we using Key Objectives?

Assessment of mathematics is extremely difficult because there are so many different strands and objectives. Therefore, teachers in England have tended to defer their judgements to pupils' results in national tests and "optional" papers. These tests lack validity because pupils' grades may be inflated if they pick up a lot of marks on low level questions. Furthermore, test results may indicate performance rather than learning. As a result, some children have passed to the next school year with a judgement of "expected" but with a very superficial understanding of some of the key areas of previous learning.

We see this particularly with mental arithmetic. Children may be able to calculate complex calculations like 2365.57 – 1578.45 using a column method but not be able to calculate 15 – 7 or 9003 – 5 mentally. These children lack "number sense" and are in danger of not being identified by our assessment system. This is where the Key Objectives system comes in to effect. It is designed to make the key areas prominent in the minds of teachers and thus to ensure that every child has a solid base of understanding on which to build. If children do not grasp these Key Objectives, they will be at a significant disadvantage to their peers.

How do the Key Objectives fit in with Mandated and Optional Tests?

Optional and National tests serve mainly as summative judgements whereas the Key Objectives are formative. They help teachers to target essential mathematical learning.

Despite the potential shortcomings of national and optional tests, we decided to assess children using optional papers in Year 3, 4 and 5 both at mid-year and end of year. The reasons for this are; to help us to track children's attainment / progress using a tool that matches the end of KS2 SATs tests; to help us to predict attainment at the end of KS2, to familiarise children with the format of testing that is mandated at the end of KS2.

How to use the Key Objectives?

The main purpose is that the Key Objectives are used ***formatively*** – to impact learning. Thus if a child has not fully grasped one of the objectives, the teacher will use any appropriate intervention strategy at her disposal (guided group work, additional work sent home, one to one support etc) in order that the child fully understands the objective.

The Key Objectives are also to be used to make ***summative*** judgements at the end of the year. A child can only be assessed to be meeting their age expectation when the teacher judges that they have "mastery" (a solid grasp) of **all** of the Key Objectives for their year group.

In summer term the Key Objectives can serve as a useful tool to prioritise these essential areas of learning before the children move up a school year. Similarly, in autumn term teachers can check that learning of the previous year's Key Objectives is secure.

How it should NOT be used

This is not a curriculum to be followed, nor a planning tool. It is important that the teacher is mindful of the National Curriculum requirements for each year group, however, the Key Objectives will help teachers to prioritise learning. For example, if it is summer term and the teacher has not managed to teach some aspects of the curriculum, they may prioritise the Key Objectives.

The teacher uses their professional judgement about how much time is spent teaching the Key Objectives. We would not necessarily advocate waiting for every child in the class to have fully grasped an objective before moving onto other areas of the curriculum (you may spend all year!). Children that have not grasped these key areas must be targeted with intervention.

Recovery Curriculum 2020

In the context of the national lockdown and pupils "falling behind" in 2020 there is a move among educationalists (see Ofsted, NCETM, DfE) to identify the key areas of learning in all subjects and ensure that children have a solid understanding of them. As such this document forms the basis of our recovery curriculum for mathematics.

Key Objectives for Reception – Cross referenced with ELGs 2020 & Ready-to-progress (RTP) criteria

1. Have a deep understanding of number to 10, including the composition of each number (ELG) *(Children will also be able to count on or back from any number within ten* and recognise and form numerals.

2. Subitise for up 5 items. (ELG) (RTP) *Please include conceptual subitising (adding 2 quantities without counting (eg see 2 dots and 3 dots and see that it is 2 add 3).*

3. 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. (ELG)

4. Begin to develop a sense of the number system by verbally counting forward to and beyond 20, pausing at each multiple of 10 recognising the pattern of the counting system. (ELG) (RTP)

5. Play games that involve moving along a numbered track, and understand that larger numbers are further along the track. (RTP) Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity. (ELG)

6. Begin to experience partitioning and combining numbers within 10. (RTP)

7. Understand the cardinal value of number words, for example understanding that 'four' relates to 4 objects. Automatically show a given number using fingers. (RTP)

8. Devise and record number stories, using pictures, numbers and symbols (such as arrows). (RTP)

9. Distribute items fairly, for example, put 3 marbles in each bag. Recognise when items are distributed unfairly (RTP). Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally. (ELG)

10. See, explore and discuss models of common 2D and 3D shapes with varied dimensions and presented in different orientations (for example, triangles not always presented on their base). (RTP)

11. Select, rotate and manipulate shapes for a particular purpose, for example: • rotating a cylinder so it can be used to build a tower • rotating a puzzle piece to fit in its place. (RTP)

Key Objectives for Year 1

1. I can read and write numbers to 100 (figures not words).

2. I can reason about the location of numbers to 20 within the linear number system, including comparing using < > and = (use of number lines) (1NPV-2)

3. I can count forwards and backwards to 100 from any number including across 10s boundaries (32, 31, 30, ?.) (87, 88, 89, ?.) (so I know one more/less than a given number) (1NPV-1)

4. I can Read, write and interpret equations containing addition (+), subtraction (-) and equals (=) symbols, and relate additive expressions and equations to real-life contexts. (eg. 12 = 8 + 4) (3+1=2+2) (1AS-2)

5. I know my year 1 addition and subtraction number facts fluently including recalling and using doubles of all numbers to 5 and corresponding halves (see appendix 1). (1NF-1)

6. Compose numbers to 10 from 2 parts, and partition numbers to 10 into parts, including recognising odd and even numbers. (1AS-1)

7. I can skip count in 2s, 5s and 10s beginning with any multiple, and count forwards and backwards through the odd numbers. (1NPV-2)

8. I can recognise and describe common 2d (square, circle, rectangle and triangle) and 3d shapes (cube, sphere, cuboid, pyramid) presented in different orientations, and know that rectangles, triangles, cuboids and pyramids are not always similar to one another. (1G-1)

9. I can compose 2D and 3D shapes from smaller shapes to match an example, including manipulating shapes to place them in particular orientations. (1G-2)

*I can form all numerals correctly. Although this is not a requirement for children to meet age expectations (it could be a "particular weakness") it makes teaching year 2 much easier if children are not reversing numerals

Key Objectives for Year 2

1. I know the place value of each digit in a two-digit number (tens/ones) and can compose and decompose two-digit numbers using standard and non-standard partitioning. (23 = 20 +3 or 23 = 10 +13) **(2NPV-1)**

2. I can reason about the location of any two-digit number (= < >), including identifying ten more/less. **(2NPV-2)**

3. I know securely all addition and subtraction facts within ten through continued practice. **(2NF-1)**

4. I can add and subtract across ten by bridging (8 + 7 = 8 + 2 + 5) and using doubling strategies (8 + 7 = 8 x 2 -1 or 7 x 2 +1). **(2AS-1)**

5. I can recognise the subtraction structure of "difference" and answer questions in the form, "How many more…?". **(2AS-2)**

6. I can use + and - number facts within ten to calculate numbers to 100. Eg. (4 + 3, 14 + 3. 84 + 3, 74 + 13) and (9 – 7, 19 – 7, 19, -17, 59 – 7). I can recognise adding and subtracting patterns when crossing a ten, (5 + 6, 25 + 16). **(2AS-3)**

7. Add and subtract within 100 by applying related one-digit addition and subtraction facts: add and subtract any 2 two-digit numbers. **(2AS-4)**

8. Recognise repeated addition contexts, representing them with multiplication equations and calculating the product, within the 2, 5 and 10 multiplication tables. **(2MD-1)**

9. Relate grouping problems where the number of groups is unknown to multiplication equations with a missing factor, and to division equations (quotitive division). **(2MD-2)**

10. I can use precise language to describe the properties of 2D and 3D shapes, and compare shapes by reasoning about similarities and differences in properties. **(2G-1)**

Can apply the above to a variety of contexts including problems and missing number calculations.

Key Objectives for Year 3

1. Know that 10 tens are equivalent to 1 hundred, and that 100 is 10 times the size of 10; apply this to identify and work out how many 10s there are in other three-digit multiples of 10.(3NPV-1)

2. I can read and write numbers to 1,000 and recognise the place value of each digit in a three-digit number. and compose and decompose three-digit numbers using standard and non-standard partitioning(234 = 200 + 30 + 4 or 234 = 100 +120 + 14).. (3NPV-2)

3. I can reason about the location of any three-digit number in the linear number system (= < >), including identifying 1, 10 or 100 more/less than any number to 1000 (including crossing hundreds boundaries (305 – 7 = ? or 897 + 5 = ?). (3NPV-3)

4. Divide 100 into 2, 4, 5 and 10 equal parts, and read scales/number lines marked in multiples of 100 with 2, 4, 5 and 10 equal parts. (3NPV-4)

5. Secure fluency in addition and subtraction facts that bridge 10, through continued practice. (3NF-1)

6. I can recall and use multiplication and division facts for the 10, 5, 2, 4, and 8,x tables and recognise products in these multiplication tables as multiples of the corresponding number. (3NF-2)

7. I understand that when I multiply a number by 10 it gets ten times bigger and when I divide it by 10 it gets ten times smaller. I can x and ÷ by 10. I can relate this knowledge to measuring mm and cm and convert between them. (3NF-3)

8. I can recall and use addition and subtraction facts for 100 (multiples of 5 and 10). Eg. 100 = 65 + ?, 100 – 15 = ? etc (3AS-1)

9. Add and subtract up to three-digit numbers using columnar methods. (3AS-2)

10. Manipulate the additive relationship: Understand the inverse relationship between addition and subtraction, and how both relate to the part–part–whole structure. Understand and use the commutative property of addition, and understand the related property for subtraction. (3AS-3)

11. Apply known multiplication and division facts to solve contextual problems with different structures, including quotitive and partitive division.(3MD-1)

12. Interpret and write proper fractions to represent 1 or several parts of a whole that is divided into equal parts. (3F-1)

13. Find unit fractions of quantities using known division facts (multiplication tables fluency).(3F-2)

14. Reason about the location of any fraction within 1 in the linear number system (comparing fractions).(3F-3)

15. Add and subtract fractions with the same denominator, within 1.(3F-4)

16. Recognise right angles as a property of shape or a description of a turn, and identify right angles in 2D shapes presented in different orientations.(3G-1)

17. Draw polygons by joining marked points, and identify parallel and perpendicular sides.(3G-2)

Key Objectives for Year 4

1. I know that 10 hundreds are equivalent to 1 thousand, and that 1,000 is 10 times the size of 100. I can apply this to identify and work out how many 100s there are in other four-digit multiples of 100.(4NPV-1)

2. I can read and write numbers to 10,000, recognise the place value in a four-digit number, and compose and decompose four-digit numbers using standard and nonstandard partitioning. (4NPV-2)

3. I can reason about the location of any four-digit number in the linear number system, including identifying the previous and next multiple of 1,000 and 100, and rounding to the nearest of each.(4NPV-3)

4. I can divide 1,000 into 2, 4, 5 and 10 equal parts, and read scales/number lines marked in multiples of 1,000 with 2, 4, 5 and 10 equal parts. (4NPV-4)

5. I can recall and use multiplication and division facts for x tables to 12 x 12. (4NF-1)

6. I can solve division problems, with two-digit dividends and one-digit divisors, that involve remainders, and interpret remainders appropriately according to the context. (4NF-2)

7. I can x and ÷ two-digit numbers by 10 and 100 (keeping to whole number quotients). I understand this as equivalent to making a number 10 or 100 times the size. I can relate this knowledge to convert between cm and m, cl and l and £ and p. (4NF-3, 4MD-1)

8. I can manipulate multiplication and division equations, and understand and apply the commutative property of multiplication. (4MD-2)

9. I understand and apply the distributive property of multiplication. (4MD-3)

10. I can reason about the location of mixed numbers in the linear number system (comparing fractions). (4F-1).

11. I can convert mixed numbers to improper fractions and vice versa. (4F-2)

12. I can add and subtract improper and mixed fractions with the same denominator, including bridging whole numbers (4F-3)

13. I can draw polygons, specified by coordinates in the first quadrant, and translate within the first quadrant. (4G-1)

14. I can identify regular polygons, including equilateral triangles and squares, as those in which the side-lengths are equal and the angles are equal. Find the perimeter of regular and irregular polygons.(4G-2)

15. I can identify line symmetry in 2D shapes presented in different orientations. Reflect shapes in a line of symmetry and complete a symmetric figure or pattern with respect to a specified line of symmetry. (4G-3)

16. I can add and subtract multiples of 1, 10, 100 and 1000 within 10,000 including crossing the thousands boundary (5997 + 5, 7002 – 7, 5347 – 3000 etc).

17. I can add and subtract numbers with up to four digits using columnar methods including with exchange.

18. I can use partitioning to double and halve any integer within 10,000.

Key Objectives for Year 5

1. I can read and write numbers to 100,000 and identify the value of the digits.

2. I can add multiples of 1, 10, 100, 1000 and 10,000 within 100,000 including crossing the ten thousands boundary (59,997 + 5, 70,002 – 7, 53,047 – 30,000 etc).

3. I can choose the correct operation and an appropriate strategy to + and – using knowledge of numbers to 100 and 1000. (eg. 100,002 – 998,000, 100,000 – 56,100,).

4. I know that 10 tenths are equivalent to 1 one and that 1 is 10 times the size of 0.1. I know that 100 hundredths are equivalent to 1 one and that 1 is 100 times the size of 0.01 (5NPV-1)

5. Recognise the place value of each digit in numbers with up to 2 decimal places, and compose and decompose numbers with up to 2 decimal places using standard and non-standard partitioning. (5NPV-2)

6. Reason about the location of any number with up to 2 decimals places in the linear number system, including identifying the previous and next multiple of 1 and 0.1 and rounding to the nearest of each. (5NPV-3)

7. Divide 1 into 2, 4, 5 and 10 equal parts, and read scales/number lines marked in units of 1 with 2, 4, 5 and 10 equal parts. (5NPV-4)

8. Convert between units of measure, including using common decimals and fractions. (5NPV-4)

9. Secure fluency in multiplication table facts, and corresponding division facts, through continued practice. (5NF-1)

10. Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 1 tenth or 1 hundredth). (5NF-2)

11. Multiply and divide numbers by 10 and 100; understand this as equivalent to making a number 10 or 100 times the size, or 1 tenth or 1 hundredth times the size. (5MD-1)

12. Find factors and multiples of positive whole numbers, including common factors and common multiples, and express a given number as a product of 2 or 3 factors. (5MD-2)

13. Multiply any whole number with up to 4 digits by any one-digit number using a formal written method. (5MD-3)

14. Divide a number with up to 4 digits by a one-digit number using a formal written method, and interpret remainders appropriately for the context. (5MD-4)

15. Find non-unit fractions of quantities. (5F-1)

16. Find equivalent fractions and understand that they have the same value and the same position in the linear number system. (5F-2)

17. Recall decimal fraction equivalents for $\frac{1}{2}$, $\frac{1}{4}$, 1/5, and 1/10, and for multiples of these proper fractions. (5F-3)

18. Compare angles, estimate and measure angles in degrees (°) and draw angles of a given size. (5G-1)

19. Compare areas and calculate the area of rectangles (including squares) using standard units. (5G-2)

Key Objectives for Year 6

1. Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000). (6NPV-1)

2. Recognise the place value of each digit in numbers up to 10 million, including decimal fractions, and compose and decompose numbers up to 10 million using standard and non-standard partitioning. (6NPV-2)

3. Reason about the location of any number up to 10 million, including decimal fractions, in the linear number system, and round numbers, as appropriate, including in contexts. (6NPV-3)

4. Divide powers of 10, from 1 hundredth to 10 million, into 2, 4, 5 and 10 equal parts, and read scales/number lines with labelled intervals divided into 2, 4, 5 and 10 equal parts. (6NPV-4)

5. Understand that 2 numbers can be related additively or multiplicatively, and quantify additive and multiplicative relationships (multiplicative relationships restricted to multiplication by a whole number). (6AS/MD-1)

6. Use a given additive or multiplicative calculation to derive or complete a related calculation, using arithmetic properties, inverse relationships, and place-value understanding. (6AS/MD-2)

7. Solve problems involving ratio relationships. (6AS/MD-3)

8. Solve problems with 2 unknowns. (6AS/MD-4)

9. Recognise when fractions can be simplified, and use common factors to simplify fractions. (6F-1)

10. Express fractions in a common denomination and use this to compare fractions that are similar in value. (6F-2)

11. Compare fractions with different denominators, including fractions greater than 1, using reasoning, and choose between reasoning and common denomination as a comparison strategy. (6F-3)

12. Draw, compose, and decompose shapes according to given properties, including dimensions, angles and area, and solve related problems. (6G-1)

13. I can add and subtract mentally with confidence where numbers are less than 100 or the calculation relies upon simple addition/subtraction and place value (eg, 6723 – 400, 78+46, 72 – 46, 10 005 – 9997, 5000 +12000)

14. Use efficient written calculation methods for all four operations including decimals.

Can apply all of the above to a variety of contexts including problems and missing number calculations.