Minimising the gaps in Mathematics

Guidance for school leaders, maths subject leaders, teachers and teaching assistants from Y1 to Y6

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INTRODUCTION

This document, which has been produced for Southwark schools, provides guidance for school leaders, maths subject leaders, teachers and teaching assistants from Y1 to Y6.

During lockdown and the closure of schools children's experiences of home learning will have differed from household to household and from year group to year group.

Gaps in learning in mathematics for all children will be evident but for some groups of children the gap in attainment will have widened.

This document aims to set out some guidance on **recovery work and recovery learning** in order to ensure that we minimise the gaps.

This document is set out under the following headings:

- Planning, using medium term maths plans
- Making cross-curricular links
- Using time effectively
- Supporting parents/ activities for home learning
- Intervention for identified groups

The Southwark maths medium term plans have been updated (revised 2020) but have **not** been adapted to reflect the closure of schools.
This is because the needs of schools, of year groups and of individual children will vary greatly so the plans, which will not be updated again until 2022, can be adapted accordingly.

In this guidance document I will refer to the Southwark medium term plans, and other Southwark documents, but the principles will apply to other planning materials.

At the time of writing this document it had not been made clear whether all children will return to school in the autumn term.
However, I hope the guidance set out in this document will be useful in planning and providing support in minimising the gaps whether all children return to school or not.

Diane Andrews, June 2020

Planning, using medium term plans

The updated Southwark maths plans, or any other medium term plans, can be used as guidance. However, in the short term they will need to be adapted for planning for all year groups and for groups within each class.

When planning for the autumn term, refer back to the spring and summer term statements for the year group below (Y1 will need to look at the curriculum for EYFS).

Many of these statements will need to be revisited before teaching the autumn term curriculum and for some children you will need to track back further.

Assessment will be key to identifying the gaps- consider ways of reviewing children's attainment, for example by having a review lesson or session prior to each new area of maths. Use Southwark's STAR grids (or assessment tool of your choice) to support these assessments.

When planning, the emphasis will need to be on **number work** initially: counting, place value, number facts (number bonds and multiplication tables facts), calculation methods (mental and written methods) fractions, decimals and percentages.
Problem solving, which includes **word problems and reasoning activities**, should be embedded throughout the maths curriculum, as usual.

Therefore, units of work focussing on number work that have been allocated five days, might, for example, be extended for a few extra days. This will vary from class to class and for different aspects of number work.

Refer to 'Written calculation policy, 2017', 'Mental calculation strategies, 2017' and 'Teaching multiplication tables, 2020' for further guidance.

NB Three tables have been included at the end of this document outlining objectives, relating to number work, from the end of the previous year.
Many of these objectives will need to revisited and secured before teaching the autumn term curriculum.

By tracking back and accelerating forward the gaps in learning should be minimised.

Links to other areas of the curriculum can be made when using and applying number work e.g. word problems focussing on addition and subtraction could be set in the context of money and measurement.

Other areas of the maths curriculum (measurement, geometry and statistics) will need to be explicitly taught but might receive less coverage initially.

Some ideas to address these areas in additional and creative ways are outlined in the following sections.

Making cross-curricular links

Other areas of the maths curriculum (measurement, geometry and statistics), which might get less coverage initially, could be incorporated into other areas of the curriculum.

By carefully considering the mathematical objectives for particular year groups and making cross- curricular links, gaps in these areas could be minimised.

Science

In the National Curriculum for Science, children are required to:

- take **measurements**, using age appropriate units and measuring equipment
- compare, classify and **sort** (objects and information)
- gather record and present **data** in a variety of ways, including tables, pictograms, bar charts, bar graphs and line graphs

By ensuring that objectives from the maths curriculum, for particular year groups, are linked to the science curriculum, gaps in these areas could be minimised.

Art and Design

Many areas of **geometry** can be incorporated into the art and design curriculum, for example: repeating patterns, exploring symmetry in shapes and logos, creating symmetrical patterns and pictures, using shapes in collage.

Children could explore tessellation by creating tessellating patterns; deciding which polygons tessellate on their own or with other polygons; investigating why some polygons tessellate and why some don't.

African and Islamic artwork could be explored when looking at patterns, symmetry and tessellation.

When examining the work of great artists and architects, links can be made to geometry by carefully selecting pieces of art work and buildings.

For example the work of Piet Mondrian could be used to explore squares and rectangles, right angles, parallel and perpendicular lines.

Other artists that could be studied include Sol Lewitt, Wasily Kandisky and M.C Escher. Children could identify other artists who make the link between art and mathematics.

Architects such as Elizabeth Scott who designed the Royal Shakespeare Theatre and Norman Foster who designed the Gherkin (30, St Mary Axe) could be studied, identifying geometrical features.

Other buildings and structures that are mathematically interesting include:
The Taj Mahal, The Eden Project, The Great Pyramids, St Paul's Cathedral, Tower Bridge.

Physical Education

Many opportunities for mathematical activities can be created through PE. For example:

- **Counting** activities linked to throwing and catching
- **Timing** running activities using a stop watch
- **Tabulating** scores in team games
- Looking at movement **patterns** through dance
- Using the language of **position and direction**, such as turns, forwards, backwards

Geography

Possible mathematical links to geography could include:

- Collecting and interpreting a range of **data**
- Using a range of **graphical representations** when considering physical geography such as climate, temperature, mountains
- Using **directional language** to describe locations and features on maps
- Linking **co-ordinates** to map work
- Exploring **large numbers** when looking at populations and distances
- Considering **time** zones

History

Mathematical links to many aspects of the history curriculum could include:

- Time lines represented as **number lines** to calculate periods in history, for example "For how long did Queen Victoria reign?" "How many years ago……?"
- Using **Roman numerals** as regnal numbers and for some significant years, for example Henry VIII; The great fire of London was in MDCLVI
- Compare and contrast different periods in history using **sorting** diagrams, such as Venn diagrams

Music

Rhythm is about exploring the way different numbers interact.
It is built from recurring mathematical patterns and sequences.
Research has shown that participating in music activities boosts **mathematical thinking and skills.**

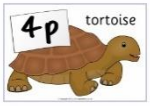
Other links between music and maths can be created by for example:

- Singing songs that have a **mathematical** focus
- Using musical instruments to support **counting** activities

English

Stories can be used to generate mathematical questions and activities, for example:

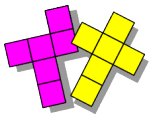
- ‘Naughty bus’- number work, counting, simple addition and subtraction, shape
- ‘The Great Pet Sale’ – money, calculation in the context of money
- ‘Jim and the Beanstalk’- measurement (length, height)
- ‘365Penguins’ – time (days and months)
- ‘The London Eye Mystery’- number, angles, time, money
- Traditional tales such as ‘Goldilocks and the Three Bears’- measurement



Design and Technology

When designing and making products for a purpose children will draw upon mathematical skills such as accurately **measuring** using appropriate equipment and **units of measurement.**

A link could be made to **geometry** and in particular making 3D shapes (polyhedron) using modelling materials and **nets** when designing packaging, for a purpose.



Computing

Links to mathematics can be made through computing:

- Using programmable floor robots- language of **movement and direction**
- **Data** representations- children can create and interpret a range of graphical representations using computing
- Algorithms, predicting and logical reasoning are all skills outlined in the ‘National Curriculum for Computing’. These are also skills being developed through **mathematics** teaching and learning

Using occasional time

Consider using any odd five or ten minutes for maths activities, for example:

- Counting in a variety of ways e.g. in multiples, in steps, number of children in class
- Practising number bonds and multiplication tables
- Finding halves and doubles of numbers
- Maths games, such as “Guess my number”, “ Guess my shape”, Times tables Bingo, Fizz Buzz
- Number puzzles e.g. magic squares
- Telling the time throughout the day using the classroom clock; calculating intervals of time, in real life situations
- Counting round the clock in fives
- Using daily routines for reinforcing months and days
- Singing songs such as School House Rock: ‘3 is a magic number’, Adele’s 8 x table song and using BBC’s ‘Supermovers’

Homework/ at home learning

During lockdown and the closure of schools, parents/carers have been more involved with their children's maths education.

This will have been guided by the children's class teachers but many organisations have provided support and ideas for teachers and for parents, for example:
BBC Bitesize, White Rose Maths Home Learning, National Numeracy Family Maths Toolkit, Third Space Learning

Communication has been the key during this time and will continue to be the key when schools are partially and fully re-opened.

There is sometimes an anxiety for parents/carers around the teaching of maths.
By ensuring that parents/carers are guided by the teachers, know age related expectations and methods (including mental calculation methods) being used they will be more confident that they are doing the right thing.

When providing **homework/ at home activities** consider ways in which parents/carers can support in minimising the gaps in learning by providing them with a range of activities and activity types. For example:

- Learning and practising number facts (number bonds and x tables facts) in a variety of ways **(See Multiplication tables Guidance, 2020)**
- Counting activities- counting everyday objects, counting forwards and backwards in ones and in multiples/groups e.g. counting pairs of socks in twos
- Telling the time- consider providing children with a small teaching clock but also encourage telling the time throughout the day using analogue clocks; using TV schedules to solve time problems; using time when cooking/following a recipe
- Money- identifying and sorting real coins; problems involving coins; problems involving money, including real life shopping activities; using catalogues (for example Argos) to 'buy' and pay for goods
- Measurement activities e.g. weighing ingredients, measuring everyday objects using appropriate units
- Identifying, naming, sorting and describing 2D and 3D shapes, including real life objects
- Looking for repeating patterns; creating repeating patterns; identifying symmetry in shapes, logos and buildings/structures, creating symmetrical patterns
- Using positional language such as on top, below, behind, in front, next to, between in practical and everyday activities
- Use directional language, such as forwards, backwards, left, right, half turn, quarter turn, full turn, in fun and practical activities
- Reinforcing calculation methods, both written methods and mental calculation strategies (provide examples and guidance) and solving related word problems
- Use tables and tallies to record information, such as a traffic survey; present information graphically; interpret a range of age appropriate graphical representations
- Playing games, such as Snakes and Ladders, Connect Four, Ludo, Chess, Dominoes. The National Numeracy Family Maths Toolkit have created: '25 fantastically fun maths games for kids to do at home'
- Encourage children to design their own board games

Further support for parents can be found in, **'Supporting your children with mathematics- guidance for parents/carers, 2020'** a document produced for Southwark schools.

Intervention/ Additional Support

Who should receive additional support?

Some children will have already been receiving additional maths support and may need to continue receiving this.
Additionally, some children might have significant gaps in their learning because of lockdown and school closures.
Head teachers, class teachers and SENCOs are the best people in identifying which children might benefit from additional support.

When should interventions take place?

Some interventions may happen during lesson time. Class teachers may work with an identified group or teaching assistants could be used to support them during a task.

Other interventions could take place outside the classroom but during lesson time – a small group or 1:1 targeted intervention led by a teaching assistant.

Interventions can also happen during lunchtime or as an after school or breakfast club.
An intervention doesn't have to take hours to be effective. Some interventions can deliver an impact in ten to fifteen minutes a day on a one-to-one basis.

Parents/carers should also be involved in any catch up/intervention work.
Activities to do at home should reflect and support the specific mathematical needs of their child.
Research (Education Endowment Foundation) has shown that parental involvement can have a moderate impact at a moderate cost on closing the gaps.

Which intervention programme should I use?

There are many intervention programmes to choose from but class teachers and SENCOs are the best people to design the intervention support programmes and target them to meet the needs of groups of children and to individuals.
This should be guided by effective **assessment.**

Any effective intervention has to be something children will enjoy doing.
A strategy to a successful maths intervention programmes could be to include the use of maths games, songs and rhymes to engage children.
Children need to see their own success and progress, so small manageable steps should be planned for.

Intervention programmes will need to be reviewed at regular intervals to ensure that they are meeting the needs of the targeted children.

The following **three** tables show the key number objectives from the previous year group that might need to be revisited and secured prior to teaching the autumn term objectives

Autumn year group	Key number, counting and place value objectives taken from the **previous** year group
1	• Count reliably with numbers from 1 to 20 • Put the numbers 1 to 20 in order • Say which number is one more or one less than a given number
2	• Count to and across 100, forwards and backwards, in ones, beginning with 0 or 1 or from any given number • Count forwards and backwards in steps of 2, 5 and 10 from 0 to the 10th multiple • Read and write numbers in numerals to 100 • Read and write numbers in words to 20 and match to the numerals • Given a number between 1 and 100, identify one more and one less • Recognise place value in teen numbers • Begin to recognise place value in two digit numbers beyond 20, using resources
3	• Count in steps of 2, 3, 5 and 10 from 0 forwards and backwards to the 12th multiple • Counts on in tens from any one-digit or two-digit number to at least 100 • Read and write numbers to at least 100 in numerals and words • Position numbers on a number line**;** read numbers on a number line where the scales are in divisions of ones, twos, fives and tens • Identify the number that is ten more or less within 100, and beyond • Order and compare numbers from 0 to 100; use <, > and = signs • Recognise the place value of each digit in a two-digit number • Partition two-digit numbers into different combinations of tens and ones
4	• Count from 0, forwards and backwards, in multiples of 2, 3, 4, 5, 8, 10, 50 and 100 to the 12th multiple • Read and write numbers to 1,000 in numerals and words • Identify the number that is ten or one hundred more or less than a given number within 1,000 • Order and compare (using < and > signs) numbers up to 1,000 • Recognise the place value of each digit in a three-digit number to 1,000
5	• Count, forwards and backwards, in multiples of 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 25, 100 and 1,000 • Read and write numbers to 10,000 in numerals and words and recognise the place value of each digit, including zero as a place holder • Identify the number that is ten, one hundred or one thousand more or less than a given number to 10,000 • Order and compare numbers within 10,000, using < and > • Round three and four-digit numbers to the nearest 10, 100 or 1,000 • Count backwards through 0 to include negative whole numbers
6	• Count, forwards and backwards, in multiples of 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 25, 100, 1,000, 10,000, 100,000 • Read and write numbers to 1,000,000 (one million) and determine the place value of each digit • Given a number, identify the number that is ten, one hundred, one thousand, ten thousand or one hundred thousand more or less within 1,000,000 • Order and compare numbers within 1,000,000 using < and > • Round any number up to 1,000,000 to the nearest 10, 100, 1,000, 10,000 or 100,000 • Count forwards and backwards with positive and negative whole numbers, including through zero

Autumn year group	Key calculation (written and mental methods) and number facts objectives taken from the **previous** year group
1	• Using objects, add and subtract two single digit numbers by counting all, counting how many are left over and by counting on and back • Solve practical problems involving doubling, halving and sharing • Solve practical problems that involve combining groups of 2, 5 or 10, or sharing into equal groups ('exceeding' descriptor)
2	• Recall and use number bonds and related subtraction facts to 10 • Add a one-digit number to a two-digit number to at least 20, including zero, using apparatus such as a marked number track/line e.g. 18 + 4 • Subtract a one-digit number from a two-digit numbers to at least 20, including zero, using apparatus, such as a number track/line e.g. 25 - 7 • Derive and use number bonds and related subtraction facts with numbers to 20 • Group small quantities, up to 20, in groups of two, five and ten, including using arrays • Use doubling facts for numbers up to double 10 • Use halving facts for numbers up to half of 20 • Begin to recognise odd and even numbers up to 20
3	• Recall and use addition and subtraction facts to 20 • Use related facts (facts to 10, facts to 20) to derive addition and subtraction facts to 100, using multiples of 10 e.g. 60 + 40 = 100; 100–40 = 60 • Add three one-digit numbers using knowledge of number pairs e .g. 8 + 9 + 2 = 10 + 9 = 19 • Add and subtract any two two-digit numbers using an efficient strategy such as partitioning or an empty number line • Recall and use multiplication and division facts for the 2, 5 and 10 times tables • Use informal methods, such as empty number lines and arrays for multiplication using known multiples (2s, 3s, 5s and 10s) • Use informal methods, such as empty number lines and arrays for division using known multiples (2s, 3s, 5s and 10s) • Recall the doubles of multiples of 10 to 100 (e.g. double 30 is 60) and recall the related halves (e.g. half of 60 is 30) • Recognise odd and even numbers within 100 and relate to multiples/groups of two
4	• Mentally add and subtract a three-digit number and ones; tens; hundreds within 1,000, including the use of jottings such as a number line • Use a range of mental strategies to add and subtract (see Y3 Mental Calculation Strategies, 2017') • Add and subtract numbers with up to three digits using the formal written methods • Recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 times tables up to the 12th multiple • Multiply a teen number by a one-digit number using the formal written method, with known multiples e.g. 14 x 3; 18 x 4 • Use the formal written layout for division using known times tables e.g. 32 divided by 4 • Determine remainders using known facts

5	• Mentally add and subtract numbers using a range of strategies, including with the use of jottings such as a number line (see Y4 Mental Calculation Strategies, 2017') • Add and subtract numbers with up to 4 digits, including decimal numbers with up to two decimal places (in the context of money or measures), using the formal written methods • Recall and use multiplication and division facts for all times tables up to 12 x 12 • Multiply and divide numbers by ten and one hundred, including numbers with one decimal place • Recognise and use factor pairs • Use a range of mental methods to multiply and divide, such as factor pairs to aid multiplication (see Y4 'Mental Calculation Strategies, 2017') • Multiply two-digit or three-digit numbers by a one-digit number using the formal written method of short multiplication • Use the formal written method of short division to divide any two- digit or three-digit number by a one-digit number, including examples with remainders
6	• Add and subtract numbers mentally, with the use of jottings, using a range of strategies (see Y5 'Mental Calculation Strategies, 2017') • Add and subtract numbers with up to 5 digits, including decimal numbers with up to three decimal places, using the formal written method • Find all factor pairs of a number and begin to find common factors of two numbers • Recognise and use square numbers up to 12 x 12 and the notation for squared (^{2}) and simple cube numbers and the notation for cubed (^{3}) • Recall all prime numbers up 19; begin to establish whether a number up to 100 is prime using knowledge of factors • Multiply and divide numbers mentally drawing on known facts, understanding of place value and using a range of strategies (see Y5 'Mental Calculation Strategies, 2017') • Multiply and divide whole numbers and those involving decimals (with up to three decimal places) by ten, one hundred and one thousand • Multiply two-digit or three-digit numbers by a one-digit number using the formal written method of short multiplication • Multiply numbers with 2 and 3 digits by a two-digit number using the formal written method of **l**ong multiplication • Divide numbers with up to 4 digits by a one-digit number using the formal written method of short division, whole number answers or with remainders; express remainders as a fraction

Autumn year group	Key fractions, decimals and percentages objectives taken from **previous** year group
1	• Solve practical problems involving doubling and halving
2	• Recognise, find and name a half (but not using fraction notation) as one of two equal parts of an object or shape • Find half of a number/set of objects with numbers to 20 using practical resources • Recognise, find and name a quarter (but not using fraction notation) as one of four equal parts of an objects or shape • Find a quarter of a number/set of objects with numbers to 20 using practical resources
3	• Identify fractions $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{4}$ and $\frac{3}{4}$ of a shape and know that all parts must be equal parts of the whole • Identify $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{4}$ and $\frac{3}{4}$ of a number e.g. a length, set of objects or quantity (including with the use of practical resources and diagrams) • Recognise the equivalence of $\frac{1}{2}$ and $\frac{2}{4}$, using simple diagrams or resources
4	• Recognise fractions as numbers: unit and non-unit fractions • Count up and down in tenths and recognise that tenths arise from dividing an object into 10 equal parts • Find fractions of a number and a discrete set of objects, including unit fractions and non-unit fractions (with small denominators), e.g.1/5 of 50, 2/5 of 30 • Recognise and show, using diagrams to support, a range of simple equivalent fractions with small denominators such as 1/3 = 2/6, 1/2= 4/8 • Order and compare (using < and >) unit fractions and fractions with the same denominator • Add and subtract fractions with the same denominator within one whole e.g. 3/10 + 2/10 = 5/10 (use diagrams to support understanding)
5	• Add and subtract fractions with the same denominator, including examples where one whole is crossed • Find unit and non-unit fractions of quantities; relate to multiplication and division • Recognise and show, using diagrams to support, families of common equivalent fractions e.g. 3/ 4 or 2/3 • Recognise and write decimal equivalents of any number of tenths or hundredths • Recognise and write the decimal equivalent for ½ , ¼, ¾ • Understand the effect of dividing a one or two-digit whole number by 10 and 100 • Understand place value in numbers with one and two decimal places • Round decimals with one decimal place to the nearest whole number • Compare and order (using < and >) numbers with the same number of decimal places up to two decimal places

6	• Compare and order fractions whose denominators are all multiples of the same number e.g. 5/8 < 3/4 • Identify equivalent fractions of a given fraction using knowledge of factors and multiples • Recognise mixed numbers and improper fractions and convert from one form to the other e.g. 5/4 = 1¼ • Add and subtract fractions with denominators that are multiples of the same number, including crossing one whole • Multiply proper fractions and simple mixed numbers by whole numbers, supported by materials and diagrams e.g. 1¼ x 3 = 3 ¾ • Find unit and non-unit fractions of whole number quantities e.g. 1/6 of 420; 5/6 of 30; relate to multiplication and division • Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents e.g. 125/1,000 = 0.125 • Read, write, order and compare numbers with up to three decimal places, including sets of numbers with different numbers of decimal places e.g. 5.25 > 5.125 • Round decimals with two decimal places to the nearest whole number and to one decimal place • Recognise the per cent symbol (%) and understand that 'per cent' means 'per hundred' • Write percentages as a fraction with the denominator 100 and as a decimal e.g. 50% = 50/100 = 0.5 (=1/2) • Calculate percentage of quantities using percentage and fraction equivalents of 1/2, 1/4, 1/10 e.g. 50% of £240 = £120, 10% of £240 = £24, 25% of £240 = £60

Summary

- Many of the key objectives from the previous year will need to be revisited before teaching the autumn term curriculum. **Assessment** will be key to identifying the gaps.
- By tracking back and accelerating forward the gaps in learning should be minimised.
- When planning, the emphasis will need to be on **number work** initially.
- **Problem solving**, which includes **word problems and reasoning activities**, should be embedded throughout the maths curriculum, as usual.
- Other areas of the maths curriculum (measurement, geometry and statistics) will need to be explicitly taught but might receive less coverage initially.
- Links to other areas of the curriculum can be made when using and applying number work e.g. word problems focussing on addition and subtraction could be set in the context of money and measurement.
- Other areas of maths (measurement, geometry and statistics), which might get less coverage initially, could be incorporated into other areas of the curriculum by making cross-curricular links, developed and reinforced through using occasional time and through homework/ at home activities.
- Some children might have significant gaps in their learning because of lockdown and school closures and these children would benefit from additional support/ intervention.

Diane Andrews, maths consultant, June 2020

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