Streethay Primary School

Progression in Addition

Main Principles

Scan QR codes to be directed to the MNP website with further information and videos.

What is maths mastery?

Teaching maths for mastery is a transformational approach to maths teaching which stems from high performing Asian nations such as Singapore. When taught to master maths, children develop their mathematical fluency without resorting to rote learning and are able to solve non-routine maths problems without having to memorise procedures.

Concrete, pictorial, abstract (CPA)

Concrete, pictorial, abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths. Developed by American psychologist, Jerome Bruner, the CPA approach is essential to maths teaching in Singapore.

Number bonds

Number bonds are a way of showing how numbers can be combined or split up. They are used to reflect the 'part-part-whole' relationship of numbers.

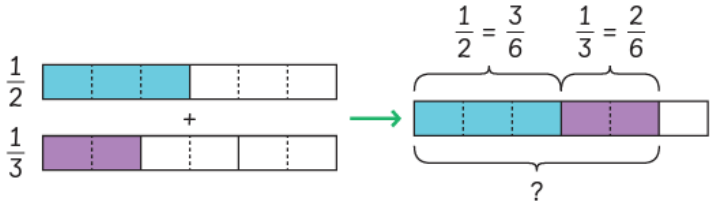
Bar modelling

The bar model method is a strategy used by children to visualise mathematical concepts and solve problems. The method is a way to represent a situation in a word problem, usually using rectangles.

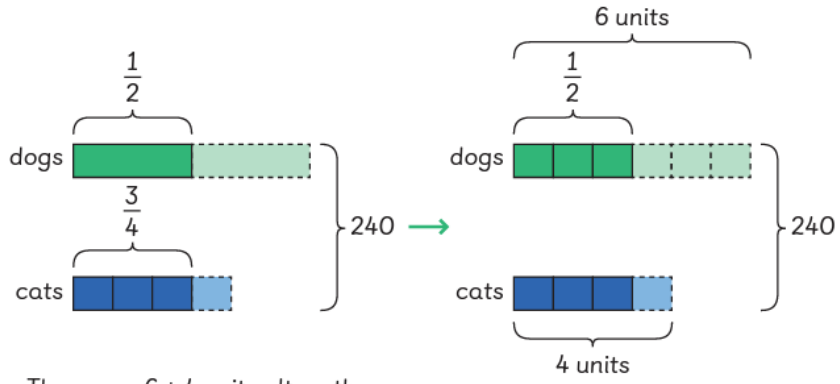
Fractions

In Singapore, the understanding of fractions is rooted in the Concrete, Pictorial, Abstract (CPA) model, where children use paper squares and strips to learn the link between the concrete and the abstract. At the heart of understanding fractions is the ability to understand that we're giving an equal part a name.

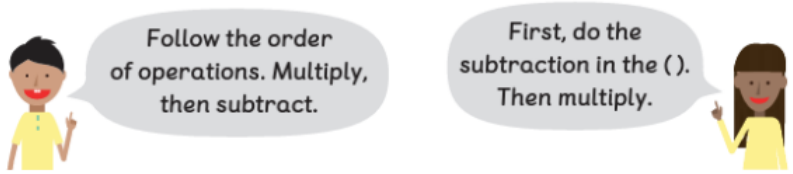
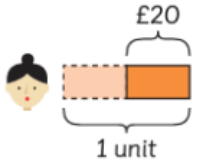
Progression in Addition—Year 6

Year Group	Topic/Strand	Representation	Key Idea
6	Addition within order of operations	First, carry out all the operations in ( ). Next, perform all the multiplication and division. Then, calculate all the addition and subtraction. Calculate. (a) $(1 + 3) \times 5 - 7 =$ ☐ (b) $1 + (3 \times 5) - 7 =$ ☐ (c) $(1 + 3) \times (7 - 5) =$ ☐	Pupils utilise the previous addition skills within mixed operation equations. Addition is carried out after multiplication and division. If only addition and subtraction are present in an equation, pupils work from left to right.
6	Adding fractions	 $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$	Pupils use their understanding of adding the same noun when adding fractions with the same and different denominators. Pupils use their understanding of equivalence to ensure the nouns and the denominators are the same before the calculation is completed.
6	Adding decimals	$$\begin{array}{r} {}^{1} \\ £3.90 \\ +\ £2.50 \\ \hline £6.40 \end{array}$$	Pupils use their understanding of adding the same nouns when adding decimal numbers. They use place–value knowledge and composing and decomposing at a rate of 10 when adding decimals. The procedure remains the same as adding whole numbers.

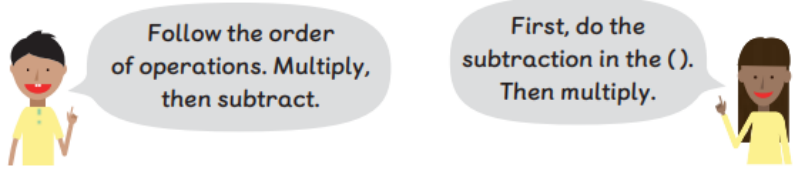
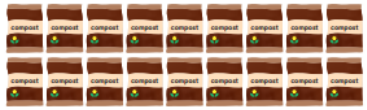
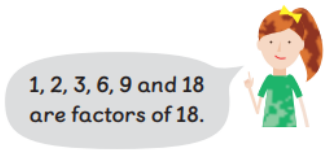
Progression in Addition—Year 6

Year Group	Topic/Strand	Representation	Key Idea
6	Bar models	 There are 6 + 4 units altogether. 10 units = 240 1 unit = 24	Pupils are expected to utilise previously learned addition skills within increasingly complex situations. The procedure of addition is often at a level previously learned in isolation but the skill being developed is identifying when to use addition within a problem.

Progression in Subtraction —Year 6

Year Group	Topic/Strand	Representation	Key Idea
6	Subtraction within order of operations	First, carry out all the operations in ( ). Next, perform all the multiplication and division. Then, calculate all the addition and subtraction. $15 - 4 \times 3 = 15 - 12 = 3$ $(15 - 4) \times 3 = 11 \times 3 = 33$ 	Pupils utilise the previous subtraction skills within mixed operation equations. Subtraction is carried out after multiplication and division. If only addition and subtraction are present in an equation, pupils work from left to right.
6	Bar models	 □ = £40 − £20 = £20	Pupils are expected to utilise previously learned subtraction skills within increasingly complex situations. The procedure of subtraction is often at a level previously learned in isolation but the skill being developed is identifying when to use subtraction within a problem.

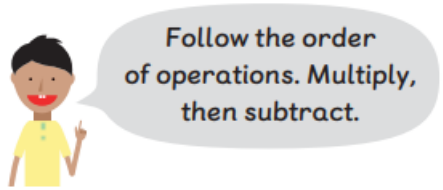
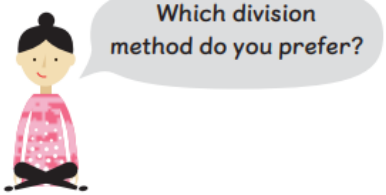
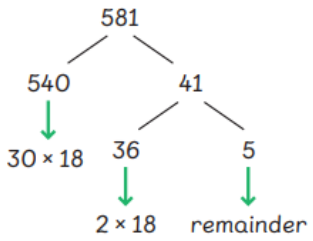
Progression in Multiplication —Year 6

Year Group	Topic/Strand	Representation	Key Idea
6	Order of operations	First, carry out all the operations in ( ). Next, perform all the multiplication and division. Then, calculate all the addition and subtraction. $15 - 4 \times 3 = 15 - 12 = 3$ $(15 - 4) \times 3 = 11 \times 3 = 33$ 	Pupils use the multiplication skills they have learned in previous years within expressions and equations that use multiple operations. Pupils learn to multiply within brackets first, then left to right in expressions and equations that use multiplication. The procedures to multiply remain the same throughout.
6	Multiplying by 2-digit numbers	£1229 × 28 = ☐ 1229 × 8 = 9832 1229 × 20 = 24 580 1229 × 28 = 34 412	Pupils revisit the formal written method, multiplying up to 4-digit numbers by 2-digit numbers.
6	Common factors	 1 row of 18 bags 1 × 18 = 18  2 rows of 9 bags 2 × 9 = 18  3 rows of 6 bags 3 × 6 = 18 	Prior learning is expanded on by finding common factors within more challenging word problems. Pupils are encouraged to partition larger numbers into known multiples to determine if the given number is a factor.

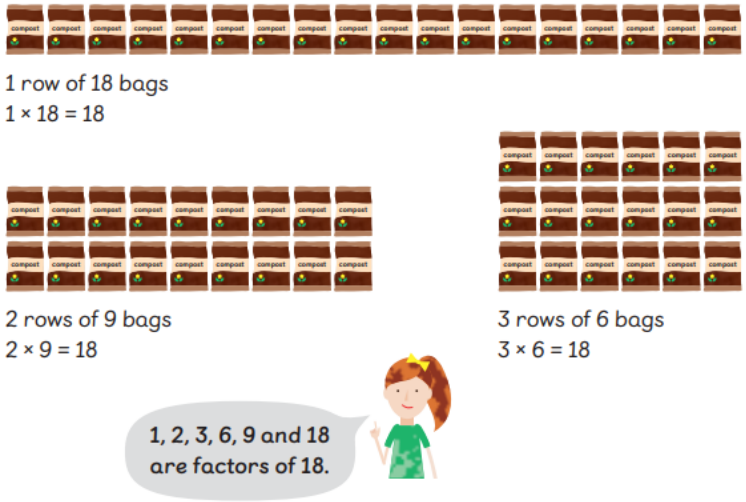
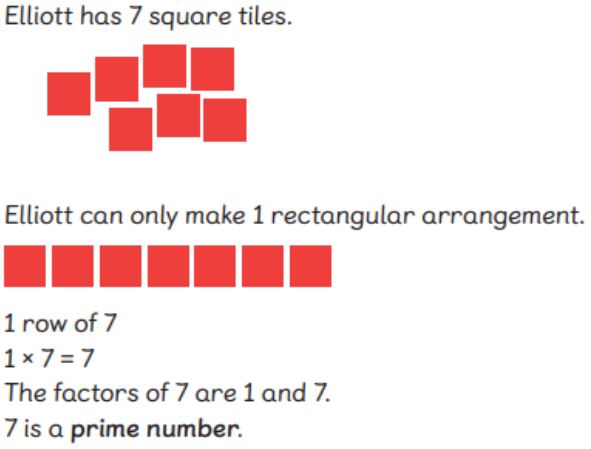
Progression in Multiplication —Year 6

Year Group	Topic/Strand	Representation	Key Idea
6	Multiplying decimals	$\begin{array}{r} {}^{1}7{}^{1}.23 \\ \times \quad 6 \\ \hline 43.38 \\ \hline \end{array}$	Pupils use the same formal written method procedure as they have previously. Pupils need to pay special attention to the places of the digits in the multiplication. It is important that they do not see the decimal point as a place but rather as a symbol used to separate the whole parts from the decimal parts of a mixed number.

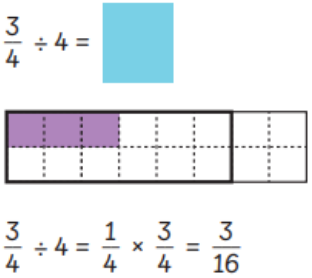
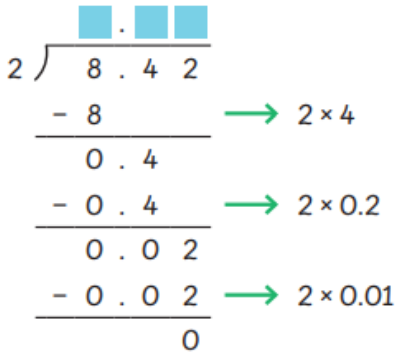
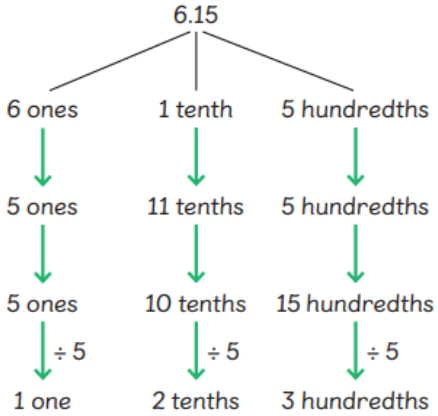
Progression in Division—Year 6

Year Group	Topic/Strand	Representation	Key Idea
6	Order of operations	$15 - 4 \times 3 = 15 - 12$ $= 3$ 	Pupils understand the order to calculate expressions and equations that have multiple operations.
6	Dividing a 2-digit number without remainder	$450 \div 15 =$ ▭ $45 \text{ tens} \div 15 = 3 \text{ tens}$ $450 \div 15 = 30$ 	Pupils use simple division to help them calculate more complex division. Initially, pupils understand that if the dividend increases by a factor of 10 and the divisor remains the same, the quotient will also increase by a factor of 10. So, if 45 ÷ 15 = 3, then 450 ÷ 15 = 30. Pupils also use their understanding of factors to divide. They progress to show division using a long formal written method. Once the long method is understood, pupils move on to divide using a short formal written method. While the process remains the same, the notation changes to keep it within the short division structure.
6	Dividing a 2-digit number with remainder	$18 \overline{)\,5\ 8^{4}1}$ 3 2 remainder 5  	The process used when dividing by a 2-digit number without a remainder stays the same when dividing with remainders. The process results in remainders that cannot be put into the equal group size as whole numbers. The context of the problem suggests the form that the remainder will take and pupils decide on the best representation for the remainder depending on the context. Pupils also use a unitary method of division to solve more complex word problems. Within these problems, they also use brackets to show the partitioning of numbers and how this can be used to support calculation in division problems.

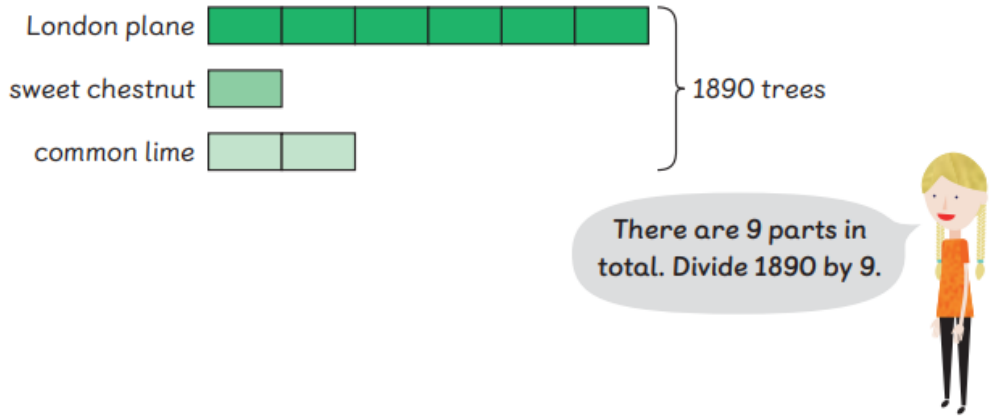
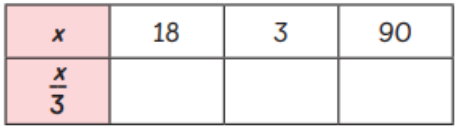
Progression in Division—Year 6

Year Group	Topic/Strand	Representation	Key Idea
6	Common multiples	<table><tr><td>Multiples of 4</td><td>4</td><td>8</td><td>12</td><td>16</td><td>20</td><td>24</td><td>28</td><td>32</td><td>36</td><td>40</td><td>44</td><td>48</td></tr><tr><td>Multiples of 6</td><td>6</td><td>12</td><td>18</td><td>24</td><td>30</td><td>36</td><td>42</td><td>48</td><td>54</td><td>60</td><td>66</td><td>72</td></tr><tr><td>Multiples of 8</td><td>8</td><td>16</td><td>24</td><td>32</td><td>40</td><td>48</td><td>56</td><td>64</td><td>72</td><td>80</td><td>88</td><td>96</td></tr></table>	Pupils work systematically through problems looking for common multiples of given numbers.
6	Common factors		Pupils use long division to find common factors of given numbers. The method used to find common factors progresses to arrays and using tables to systematically find possible common factors.
6	Prime numbers		Arrays are used as they have been previously, l ooking for rectangular patterns. Pupils see that numbers that can only be made into 1 rectangular arrangement are prime numbers with factors of itself and 1.

Progression in Division —Year 6

Year Group	Topic/Strand	Representation	Key Idea
6	Dividing fractions by whole numbers	$\frac{3}{4} \div 4 =$  $\frac{3}{4} \div 4 = \frac{1}{4} \times \frac{3}{4} = \frac{3}{16}$	Pupils relate dividing fractions by a whole number to multiplying by its reciprocal. So, dividing by 4 is related to multiplying by 1 4 . We also read this as ‘ 1 4 of’. The procedure of dividing fractions by whole numbers is supported by the use of bar models and pictorial representation.
6	Dividing decimals without renaming		Initially, place–value counters are used to show the division procedure that should be well known by pupils at this stage. The long formal written method is then used to divide decimal numbers without renaming the dividend. The procedure for long division does not change. Pupils need to be mindful of the placement of the digits and remember that the decimal point does not represent a place. Simply, the decimal point separates the whole and fractional parts of a number.
6	Dividing decimals with renaming	 $6.15 \div 5 = 1.23$	Initially, place–value counters are used to show the division procedure that should be well known by pupils at this stage. The long formal written method is then used to divide decimal numbers without a remainder. The procedure for long division with renaming does not change from what pupils have experienced previously. Pupils need to be mindful of the placement of the digits and remember that the decimal point does not represent a place. Simply, the decimal point separates the whole and fractional parts of a number.

Progression in Division—Year 6

Year Group	Topic/Strand	Representation	Key Idea
6	Dividing decimals by a 2-digit whole number	4.65 kg ÷ 15 = ☐ 4.65 4.5 = 45 tenths ÷ 15 = 3 tenths 0.15 = 15 hundredths ÷ 15 = 1 hundredth 3 tenths + 1 hundredth = 0.3 + 0.01 = 0.31 4.65 ÷ 15 = 0.31	Pupils initially divide decimal numbers by 2-digit whole numbers where the dividend is easily broken into multiples of the divisor. Number bonds demonstrate the partitioning in order to divide using long and short formal written methods of division.
6	Ratio		Pupils use a unitary method involving division to determine quantities in ratio problems. This approach is supported by the use of bar models.
6	Algebra		Pupils use their understanding of division to determine unknown values with algebraic expressions and equations.