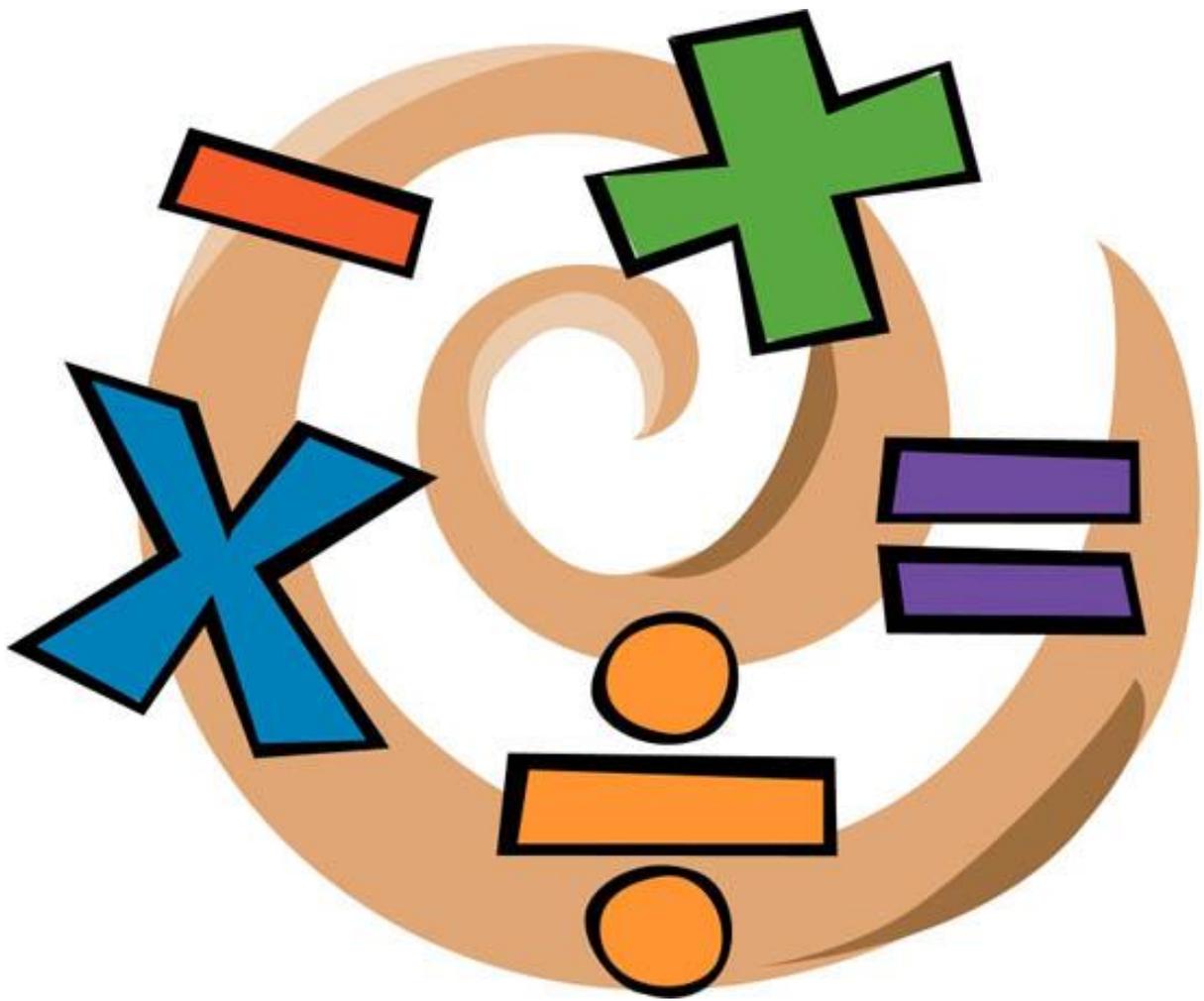


GREATHAM PRIMARY SCHOOL

Progression in written calculation



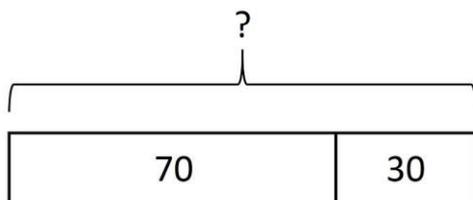
Singapore Bar Method

This is a teaching method based on the national mathematics curriculum. The term is used to describe an approach, originally developed in Singapore, for teaching students to learn and master fewer mathematical concepts at greater depth as well as having them learn these concepts using a three-step learning process. The three steps are: concrete, pictorial, and abstract. In the concrete step, students engage in hands-on learning experiences using concrete objects such as counters or dice. This is followed by drawing pictorial representations of mathematical concepts. Students then solve mathematical problems in an abstract way by using numbers and symbols for a range of problems. This will be taught at a relevant level across all year groups.

E.Gs.

1

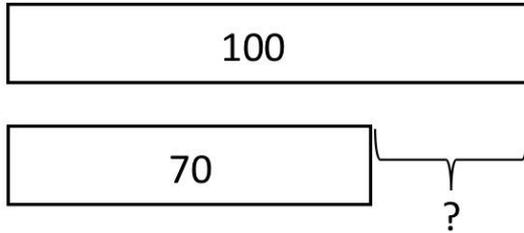
There were 70 boys and 30 girls in a school. How many were there altogether?



$$70 + 30 = 100$$

2

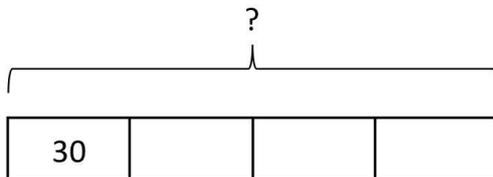
If there are 100 children at a school and 70 are boys, how many are girls?



$$100 - 30 = 70$$

3

There are 4 classes in a school. Each class has 30 children in it. How many children are there in the school altogether?



$$30 \times 4 = 120$$

Year 1

addition

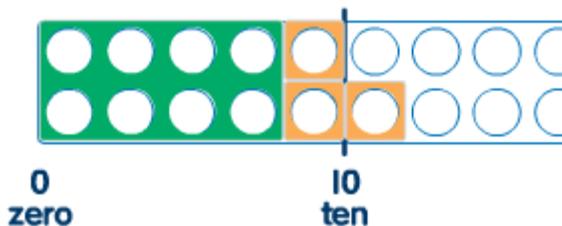
read, write and interpret mathematical statements involving (+) and equals (=) signs

add one-digit and two-digit numbers to 20, including zero

place value

Count in 1s

e.g $10 + 1$

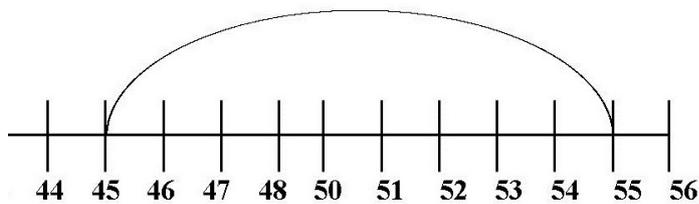


Count in 10s

e.g. $45 + 10$ without counting on in 1s

Add 10 to any given 2-digit number

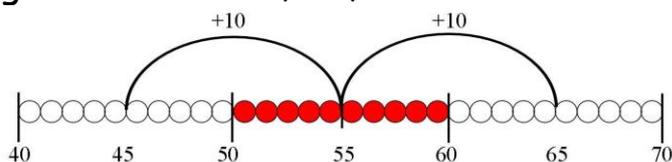
$$45 + 10$$



Add, putting the larger number first

Count on in 10s

e.g. $45 + 20$ as 45, 55, 65



missing number problems such as $7 = \square + 3$

subtraction

read, write and interpret mathematical statements involving subtraction (-) and equals (=) signs

subtract one-digit and two-digit numbers to 20, including zero

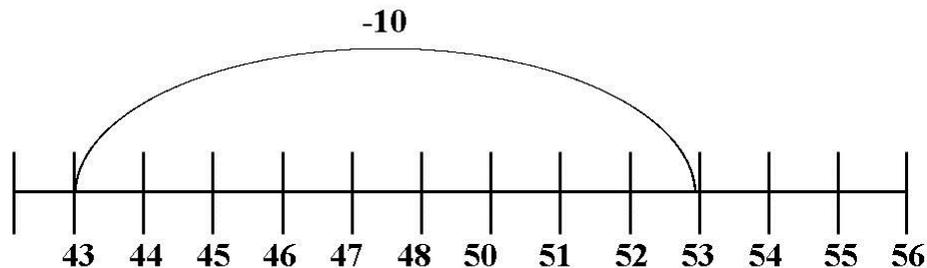
place value

Count back in 1s

e.g. Know $53-1$

Count back in 10s

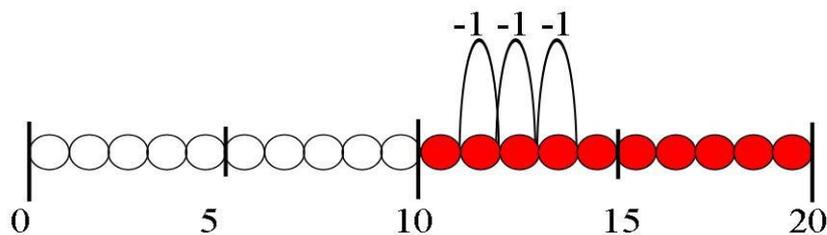
e.g. Know $53-10$ without counting back in 1s



taking away

Count back in 1s

e.g. $14-3$ as 14, 13, 12, 11



missing number problems such as $7 = \square - 9$

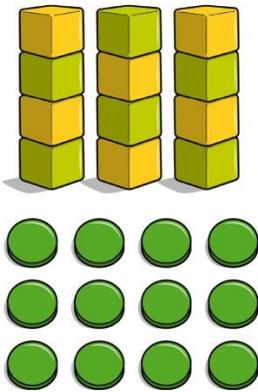
multiplication

solve one-step problems using concrete objects, pictorial representations and arrays with the support of the teacher

grouping

Begin to use visual and concrete arrays and sets of objects to find the answers to 'three groups of four' or 'two groups of five'

e.g. three groups of four

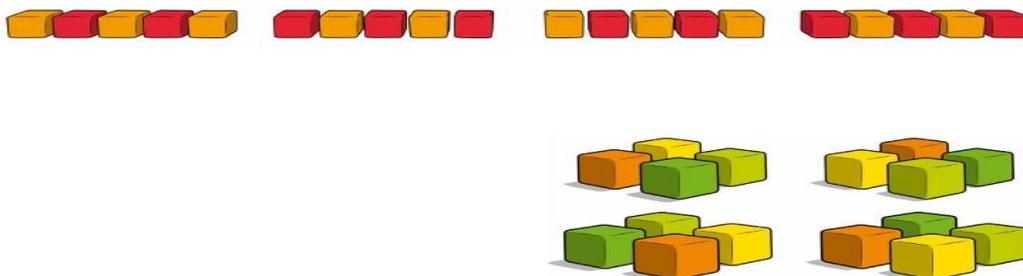


division

solve one-step problems using concrete objects, pictorial representations and arrays with the support of the teacher

grouping

e.g. 'How many towers of five cubes can I make from twenty cubes?' as $_ \times 5 = 20$ and also $20 \div 5 =$



sharing

Begin to find half or a quarter of a quantity using sharing

e.g. find a quarter of 16 cubes by sorting the cubes into four piles

Year 2

addition

place value

Know 1 more or 10 more than any number

e.g. 1 more than 67

e.g. 10 more than 85

partitioning

e.g. $55 + 37$ as $50 + 30$ and $5 + 7$, then finally combine the two totals: $80 + 12$

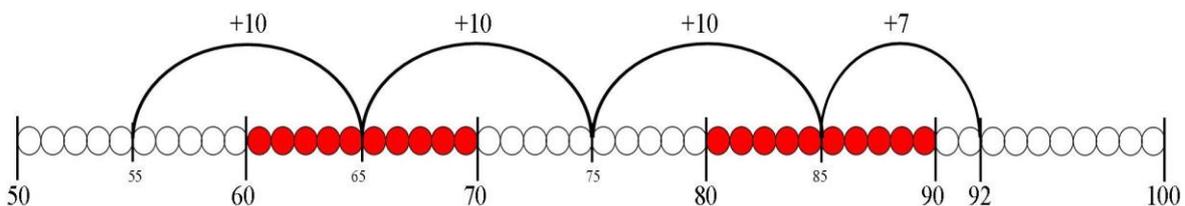
counting on

Add 10 and multiples of 10 to a given 1- or 2-digit number

e.g. $76 + 20$ as 76, 86, 96 or in hops: $76 + 20 = 96$

Add two 2-digit numbers by counting on in 10s, then in 1s

e.g. $55 + 37$ as $55 + 30$ (85) $+ 7 = 92$



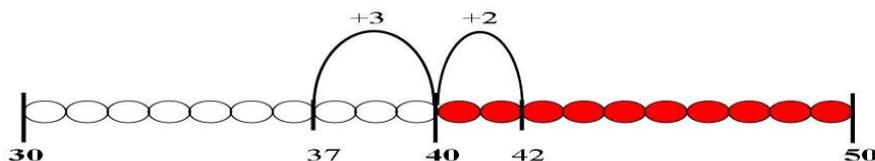
add near multiples of 10

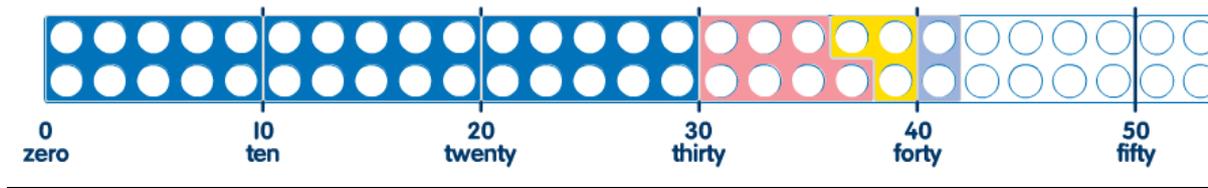
e.g. $46 + 19$ - Start at largest number

e.g. $63 + 21$ - With 2 digit numbers, partition the second number (e.g. $21 = 20 + 1$)

bridging 10

$37 + 5 =$





subtraction

place value

Know 1 less or 10 less than any number

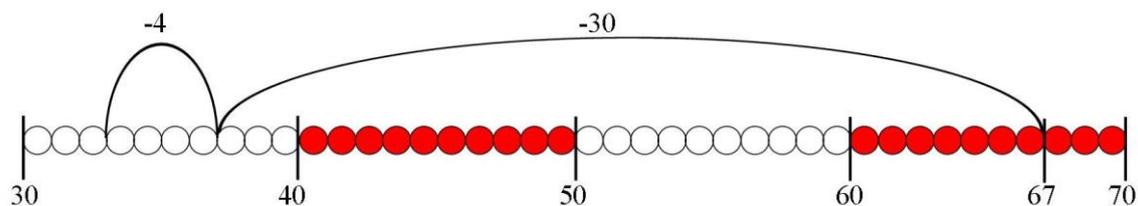
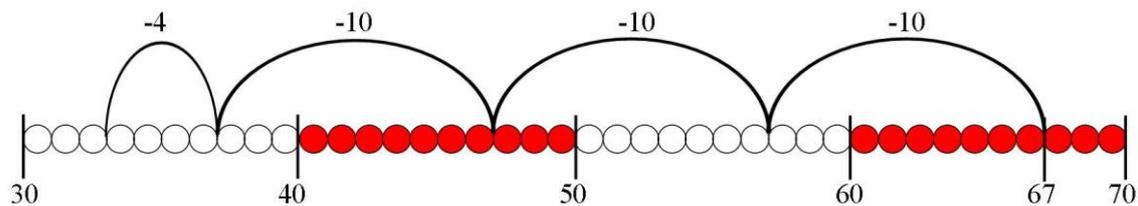
e.g. 1 less than 74

e.g. 10 less than 82

taking away

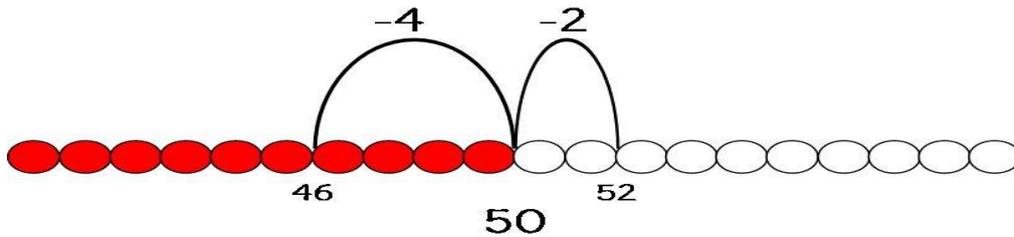
Subtract two 2-digit numbers by counting back in 10s, then in 1s

e.g. $67 - 34$ as 67 subtract 30 (37) then count back 4 (33)



bridging 10

e.g. $52 - 6$ as $52 - 2$ (50) - 4 = 46



know that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot

recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

Know that addition is commutative but subtraction is not.

multiplication

calculate mathematical statements and write them using the multiplication (\times) and equals (=) signs (2,5,10 \times tables and begin to know the 3 \times)

solve problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

counting in steps of 2,3,5 and 10

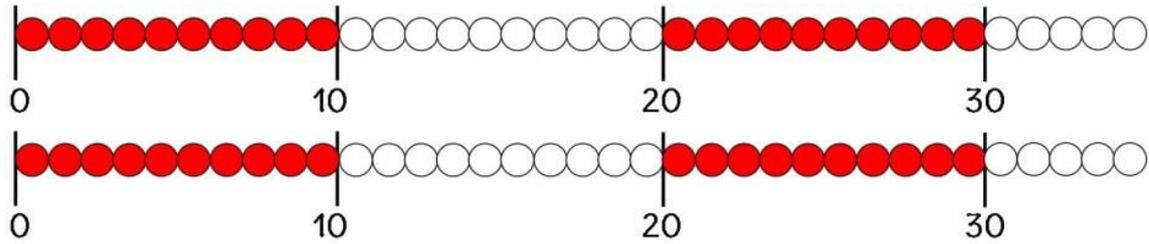
repeated addition

e.g. $5 + 5 + 5 + 5 + 5 + 5 = 30$

doubling and halving

Begin to know doubles of multiples of 5 to 100

e.g. double 35 is 70



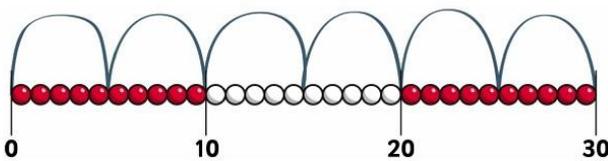
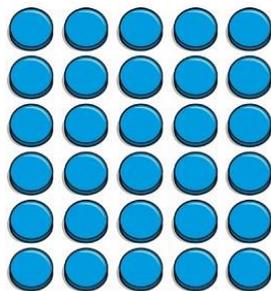
Begin to double 2-digit numbers less than 50 with 1s digits of 1, 2, 3, 4 or 5

grouping

Use arrays to find answers to multiplication and relate to 'clever' counting

e.g. 3×4 as three lots of four things

e.g. 6×5 as six steps in the 5s count as well as six lots of five



division

calculate mathematical statements and write them using division (\div) and equals (=) signs

solve problems involving division, using materials, arrays, repeated addition, mental methods and division facts, including problems in contexts

counting in steps

doubling and halving

grouping

know that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
fractions

fractions

write simple fractions

e.g $\frac{1}{2}$ of 6 = 3

Year 3

addition

add and numbers with up to three digits

expanded column addition

$$\begin{array}{r} \text{T U} \\ + 24 \\ 33 \\ \hline 7 \\ 50 \\ \hline \underline{57} \end{array}$$

leading to

expanded column addition

$$\begin{array}{r} \text{H T U} \\ 125 \\ + \underline{133} \\ 8 \\ 50 \\ \underline{200} \\ \underline{258} \end{array}$$

This will move to using exchanging

E.G 48+36

$$\begin{array}{r} \text{T U} \\ + 48 \\ \underline{36} \\ 14 \\ \underline{70} \\ \underline{84} \end{array}$$

leading to

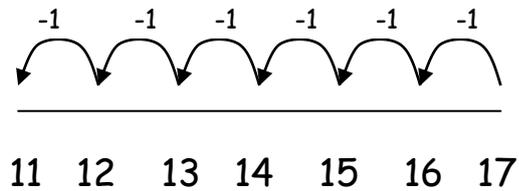
$$\begin{array}{r} \text{T U} \\ + 48 \\ \underline{36} \\ \underline{84} \\ 1 \end{array}$$

subtraction

subtract numbers with up to three digits

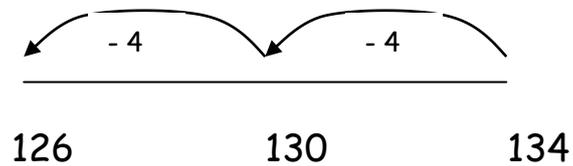
counting back

E.g. $17 - 6$



So $17 - 6 = 11$

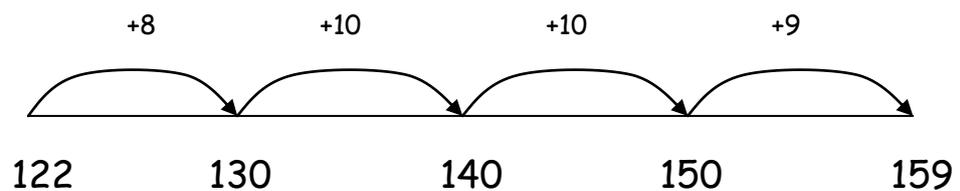
E.g. $134 - 8$



So $134 - 8 = 126$

counting on

E.g. $159 - 22$



So counting the jumps $59 - 22 = 10 + 10 + 9 + 8 = 37$

partitioning leading onto vertical subtraction (without exchange)

e.g 276 - 63

$$\begin{array}{r} 200 \ 70 \ 6 \ _ \\ \underline{\quad 60 \ 3} \\ 200 \ 10 \ 3 \end{array} \quad \text{so } 276-63=213$$

e.g. 546-324

$$\begin{array}{r} 500 \ 40 \ 6 \ - \\ \underline{300 \ 20 \ 4} \\ \underline{200 \ 20 \ 2} \end{array} \quad \text{so } 546-324=222$$

multiplication

multiply 2 digits by a single digit

grid multiplication

E.g. 13 x 7

x	10	3
7	70	21

70

21 + So 13 x 7 = 91

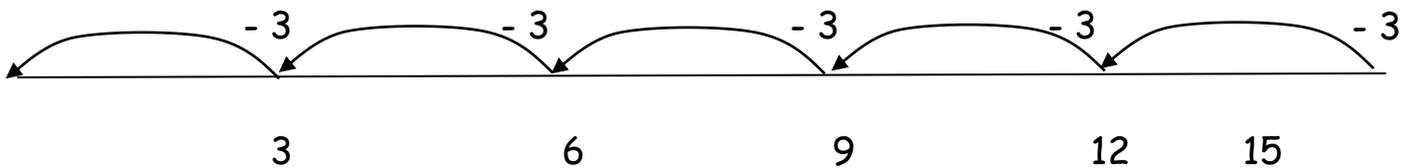
91

division

groups for division can be represented on a number line as repeated subtraction

15 divided into groups of 3

$$15 \div 3 = 5$$



fractions

add and subtract fractions with the same denominator within one whole [for example, $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$]

Year 4

addition

add numbers with up to 4 digits

E.G 1424+327

exchanging (compact)

Th H T U

$$\begin{array}{r} 1424 \\ + \quad 327 \\ \hline 1751 \\ 1 \end{array}$$

Use expanded column addition to add amounts of money

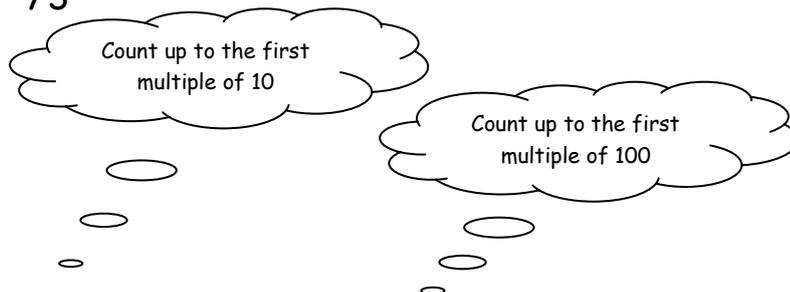
$$\begin{array}{r} £6.26 \\ +£7.05 \\ \hline £13.31 \\ 1 \end{array}$$

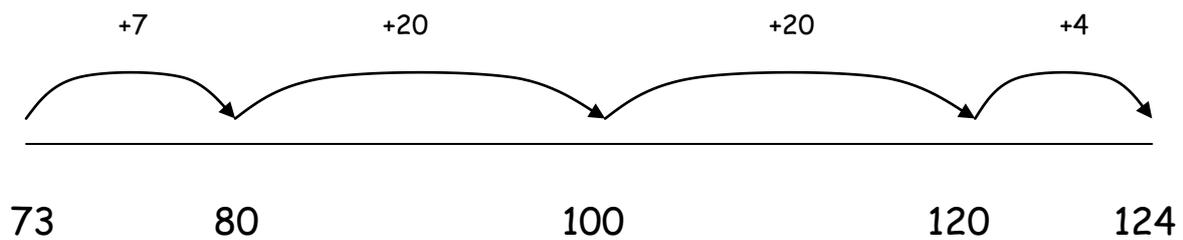
Subtraction

subtract numbers with up to 4 digits

continue to count on

E.g. 124 - 73





So counting the jumps $20 + 20 + 7 + 4 = 51$

compact vertical subtraction (with exchange)

E.g. $43 - 27$

$$\begin{array}{r}
 \text{T U} \\
 4 \overset{1}{3} \\
 \underline{27} \\
 16
 \end{array}$$

$$\begin{array}{r}
 3 \\
 -
 \end{array}$$

So $43 - 27 = 16$

multiplication

multiply two-digit and three-digit numbers by a one-digit number and two-digit numbers by two digit numbers

grid method as a lead in to formal method (to aid understanding)

E.g. 124×7

x	100	20	4
7	700	140	28

$$\begin{array}{r}
 700 \\
 140 \\
 \underline{28} \\
 \underline{868}
 \end{array}$$

So $124 \times 7 = 868$

two-digit numbers by two digit numbers

E.g. 34×26

x	30	4	H T U
20	600	80	6 8 0 +
6	180	24	<u>1 0 4</u>
			<u>8 8 4</u>

So $34 \times 26 = 884$

short multiplication of numbers up to 4 digits by a one digit numbers

$$\begin{array}{r}
 435 \\
 \times 8 \\
 \hline
 3480 \\
 24
 \end{array}$$

division

dividing using the chunking method (both in a grid and on a number line)

1	4
2	8
3	12

e.g. $48 \div 4$

$$\begin{array}{r} 48 \\ - \\ \hline 40 \quad (\underline{10} \times 4) \\ - \\ \hline 8 \\ - \\ \hline 8 \quad (\underline{2} \times 4) \\ - \\ \hline 0 \end{array}$$

4	16
5	20
10	40

$$10 + 2 = 12$$

$$\text{So } 48 \div 4 = 12$$

e.g. $364 \div 7 =$

$$\begin{array}{r} 364 \\ - \\ \hline 350 \quad (\underline{50} \times 7) \\ - \\ \hline 14 \\ - \\ \hline 14 \quad (\underline{2} \times 7) \\ - \\ \hline 0 \end{array}$$

1	7
2	14
4	28
5	35
10	70
50	350

$$\underline{50} + \underline{2} = 52$$

So $364 \div 7 = 52$ **divide numbers up to 4 digits by a one-digit number using short division** (using place value counters)

$$139 \div 3$$

$$\begin{array}{r} 46 \text{ r } 1 \\ 3 \overline{) 139} \\ \underline{3} \\ 0 \\ \underline{0} \\ 0 \\ \underline{0} \\ 0 \\ \underline{0} \\ 0 \end{array}$$

fractions

Add and subtract fractions with the same denominator

e.g. $\frac{3}{8} + \frac{1}{8} = \frac{5}{8}$

$$\frac{6}{7} - \frac{2}{7} = \frac{4}{7}$$

Add and subtract improper fractions

e.g. $\frac{7}{4} + \frac{5}{4} = \frac{12}{4}$ which = 3

$$\frac{6}{4} - \frac{5}{4} = \frac{1}{4}$$

Year 5

addition

add whole numbers with more than 4 digits

e.g. $45,222 + 23,782 =$

$$\begin{array}{r} 45222 \\ + 23782 \\ \hline 69004 \\ 11 \end{array}$$

add towers of several large numbers

add several amounts of money

$$\begin{array}{r} £34.58 \\ £26.24 + \\ \hline £12.17 \\ \hline £72.99 \\ 11 \end{array}$$

add decimals to 2 and 1 decimal places

$$\begin{array}{r} 15.68 \\ \hline 27.86 + \\ \hline 43.54 \\ 111 \end{array}$$

subtraction

subtract whole numbers with 4 digits and more

compact method

E.g. $3007 - 2964$

$$\begin{array}{r} \text{Th H T U} \\ \begin{array}{r} \overset{2}{3} \overset{1}{0} \overset{0}{0} \overset{1}{7} \\ - \\ \underline{2964} \\ \underline{0043} \end{array} \end{array}$$

So $3007 - 2964 = 43$

vertical subtraction with decimals to 2 and 1 decimal places

E.g. $3007.65 - 2964.33$

$$\begin{array}{r} \text{Th H T U . 1/10 1/100} \\ \begin{array}{r} \overset{2}{3} \overset{1}{0} \overset{0}{0} \overset{1}{7} . \overset{6}{6} \overset{5}{5} \\ - \\ \underline{2964.33} \\ \underline{0043.32} \end{array} \end{array}$$

So $3007.65 - 2964.33 = 43.32$

multiplication

short multiplication of numbers up to 4 digits by a one digit numbers

$$\begin{array}{r} 435 \\ \times 8 \\ \hline 3480 \\ 24 \end{array}$$

long multiplication for up to 4 digits numbers by 2 digits

$$\begin{array}{r} 48 \\ \times 16 \\ \hline 288 \\ 480 \\ \hline 768 \\ 1 \end{array}$$

division

divide numbers up to 4 digits by a one-digit number using short division

$$139 \div 3$$

$$\begin{array}{r} 46 \text{ r } 1 \\ 3 \overline{) 139} \\ \underline{ 12} \\ 19 \\ \underline{ 18} \\ 1 \end{array}$$

give remainders as whole numbers or as fractions

divide numbers up to 3 digits by a two-digit whole number using long division

e.g. $560 \div 24$

$$\begin{array}{r} 23 \text{ r}8 \\ 24 \overline{) 560} \\ \underline{480} \\ 80 \\ \underline{72} \\ 8 \end{array}$$

fractions

add and subtract fractions with the same denominator

e.g. $\frac{3}{8} + \frac{1}{8} = \frac{5}{8}$
 $\frac{6}{7} - \frac{2}{7} = \frac{4}{7}$

add denominators that are multiples of the same number

$$\frac{3}{4} + \frac{1}{8} = \frac{7}{8}$$

add and subtract fractions with different denominators and mixed numbers

$$\frac{2}{3} \times \frac{5}{6} = \frac{10}{18} = \frac{5}{9}$$

$$2 \frac{3}{4} \times 1 \frac{1}{2} = \frac{11}{4} \times \frac{3}{2} = \frac{33}{8} = 4 \frac{1}{8}$$

divide numbers up to 4 digits by a two-digit whole number using long division

e.g. $560 \div 24$

$$\begin{array}{r} 23 \text{ r}8 \\ 24 \overline{) 560} \\ \underline{480} \\ 80 \\ \underline{72} \\ 8 \end{array}$$

fractions

add and subtract fractions with different denominators and mixed numbers

$$2/3 \times 5/6 = 10/18 = 5/9$$

$$2 \frac{3}{4} \times 1 \frac{1}{2} = 11/4 \times 3/2 = 33/8 = 4 \frac{1}{8}$$

multiply simple pairs of proper fractions, writing the answer in its simplest form

e.g. $1/4 \times 1/2 = 1/8$

divide proper fractions by whole numbers

e.g. $1/3 \div 2 = 1/6$

