



Mental Recall

Strategies

N/A

- **BIDMAS** - Brackets, Indices, Division, Multiplication, Addition, Subtraction
- **Add near doubles of decimals** - e.g. $5.35 + 5.36$ goes to double $5.35 + 0.01 =$ double $5 +$ double $0.35 + 0.01 = 10 + 0.7 + 0.01 = 10.71$
- **Rounding and adjusting with decimals** - e.g. $44.3 + 2.9 = 44.3 + 3 - 0.1 = 47.3 - 0.1 = 47.2$ (see examples below)
- **Use what you know...** - e.g. $630 + 430 = 1060$, so $0.63 + 0.43 = 1.06...$

Year Group objectives:

Concrete

Pictorial

Abstract

Addition and Subtraction

use their knowledge of the order of operations to carry out calculations involving the 4 operations

solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

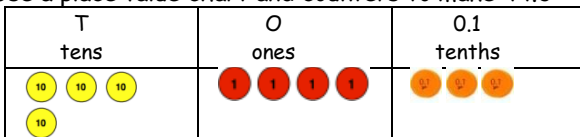
solve problems involving addition, subtraction, multiplication and division

use estimation to check answers to calculations and determine, in the

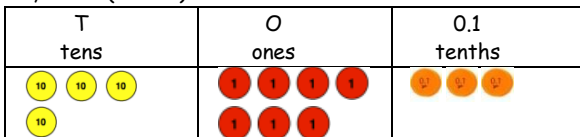
Rounding and adjusting with decimals

e.g. $44.3 + 2.9 = 44.3 + 3 - 0.1 = 47.3 - 0.1 = 47.2$

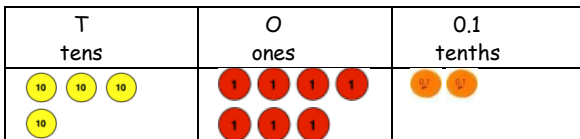
Use a place value chart and counters to make 44.3:



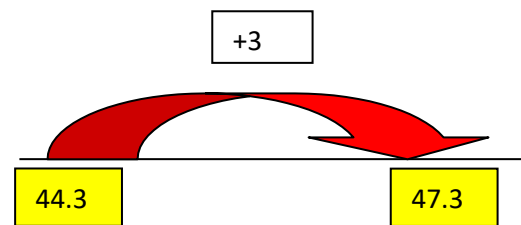
Now, add 3 (3 ones) to make 47.3:



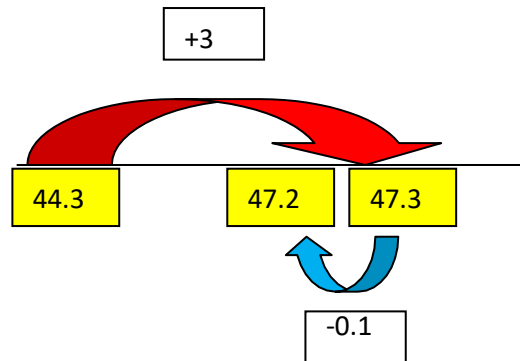
Finally, subtract 0.1 to make 47.2:



e.g. $44.3 + 2.9 = 44.3 + 3 - 0.1 = 47.3 - 0.1 = 47.2$
Using a number line to add 3 to 44.3:



Now, subtract the 0.1 to make 47.2:



e.g. $44.3 + 2.9 = 44.3 + 3 - 0.1 = 47.3 - 0.1 = 47.2$

$$44.3 + 3 = 47.3$$

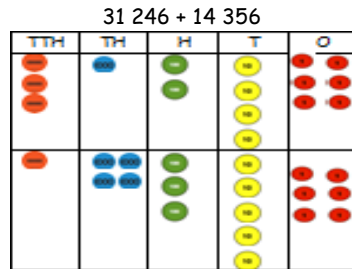
$$47.3 - 0.1 = 47.2$$

context of a problem, an appropriate degree of accuracy

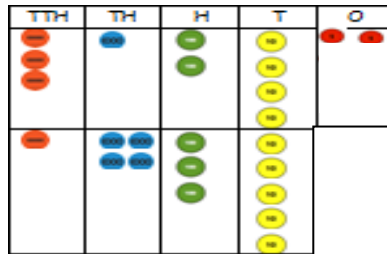
perform mental calculations, including with mixed operations and large numbers

Column method with regrouping

Make both numbers on a place value grid using place value counters.

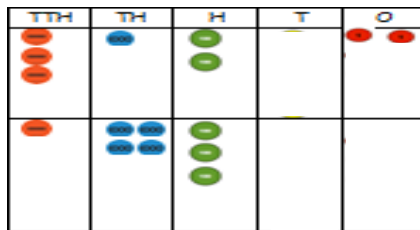


Add the ones that would now create 1 ten and 2 ones (12)

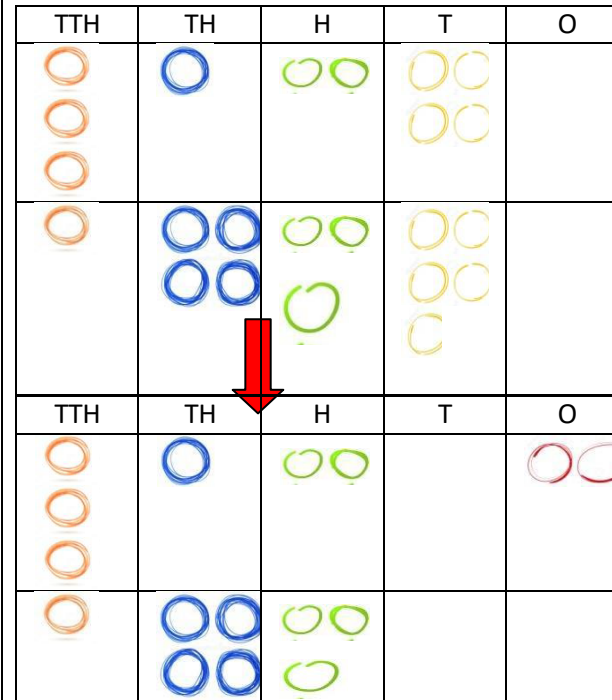


10

Add the tens that would now create 10 tens or 1 hundred.



100



Children can draw a pictorial representation of the columns and place value counters to further support their learning and standing.

TTH TH H T O
 30000 + 1000 + 200 + 40 + 6
 10000 + 4000 + 300 + 50 + 6

40000 + 5000 + 500 + 90 + 12 = 45602

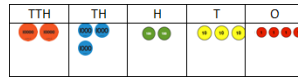
As the children progress, they will move from the expanded to the compacted method.

31246
 + 14356

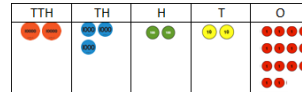
 45602
 11

Column method with regrouping

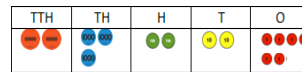
$$23\ 234 - 11\ 528 =$$



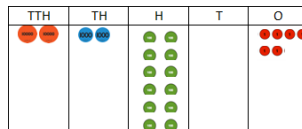
Step 1: Use a place value grid and counters to make the larger number from the calculation.



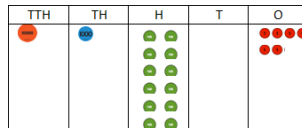
Step 2: Start with the ones, can I subtract 8 from 4 easily? I need to exchange one of my tens for 10 ones. Now I can subtract my ones.



Step 3: I can solve the tens simply. Now look at the hundreds, can I take away 5 hundreds easily? I need to exchange 1 thousand for 10 hundreds.



Step 4: Now I can subtract 5 tens and complete the rest of my subtraction.



$$23\ 234 - 11\ 528 = 11\ 706$$

TTH	TH	H	T	O
	2000		20	
	3000	¹ 200	30	¹ 4
	10000	1000	500	20 8

$$10000\ 1000\ 700\ 00\ 6 = 11\ 706$$

As the children progress, they will move from the expanded to the compacted method.

	21	21
	23234	
-	11528	
<hr/>		
	11706	



Mental Recall

- Know doubles and halves of all numbers to 10 000
- Use and apply times table / multiple knowledge for generalisations - e.g. any number that has a digit sum of a multiple of 3 is exactly divisible by 3 - e.g. $72 = 7 + 2 = 9$ which is divisible by 3 / $111\ 636 = 1 + 1 + 1 + 6 + 3 + 6 = 18$ which is divisible by 3...

Strategies

- **BIDMAS** - Brackets, Indices, Division, Multiplication, Addition, Subtraction
- **Scaling up / down** - use multiplication/division knowledge to scale up or down depending on the context
- **Multiply and divide decimals by 10/100/1000 & 10 000** - the digits move one/two/three/four place(s) to the left or right and we need the '0' to act as a place holder...NOT ADD A ZERO! (see example below)

Year Group objectives:

Concrete

Pictorial

Abstract

Multiplication

multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication

divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context

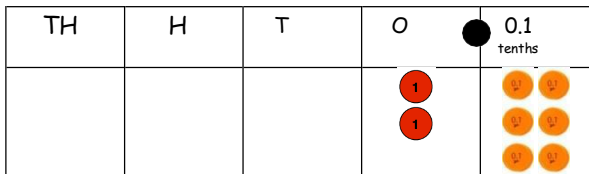
divide numbers up to 4 digits by a two-digit number using

Multiply and divide decimals by 10/100/1000 & 10 000

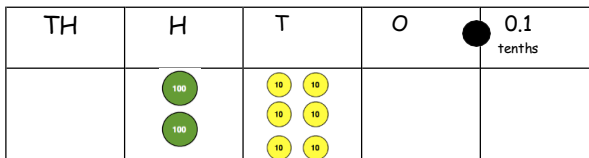
The digits move one/two/three/four place(s) to the left or right and we need the '0' to act as a place holder...NOT ADD A ZERO!

e.g. 2.6×100

1. Using place value counters, plot 2.6 onto a place value chart:



2. Now, move the place value counters 2 places to the right because we are multiplying by 100:

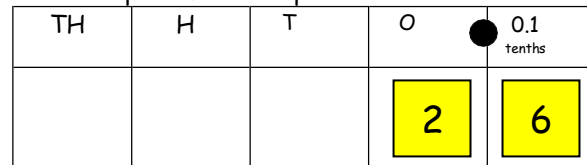


$3\ 2.6 \times 100 = 260$

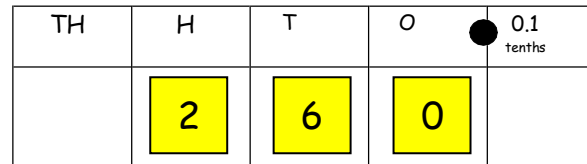
The digits move one/two/three/four place(s) to the left or right and we need the '0' to act as a place holder...NOT ADD A ZERO!

e.g. 2.6×100

1. Using numbered post-it notes that can be moved, plot 2.6 onto a place value chart:



2. Now, move the place value counters 2 places to the right because we are multiplying by 100:



3. Zero acts as a place holder in the ones column. $2.6 \times 100 = 260$

The digits move one/two/three/four place(s) to the left or right and we need the '0' to act as a place holder...NOT ADD A ZERO!

e.g. 2.6×100

$2.6 \times 100 = 260$

$260 \div 100 = 2.6$

$260 \div 2.6 = 100$

1324 x 23

Compact method

		H	T	O
	1	3	2	4
X			2	3
<hr/>				
			1	2
			6	0
		9	0	0
	3	0	0	0
			8	0
		4	0	0
	6	0	0	0
2	0	0	0	0
<hr/>				
3	0	4	5	2
<hr/>				
1	1	1		

Expanded method moving towards more compact method:

		H	T	O
	1	3	2	4
X			2	3
<hr/>				
3	0	4	5	2
<hr/>				
1	1	1		

the formal written method of short division where appropriate, interpreting remainders according to the context

solve problems involving addition, subtraction, multiplication and division

use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

perform mental calculations, including with mixed operations and large numbers

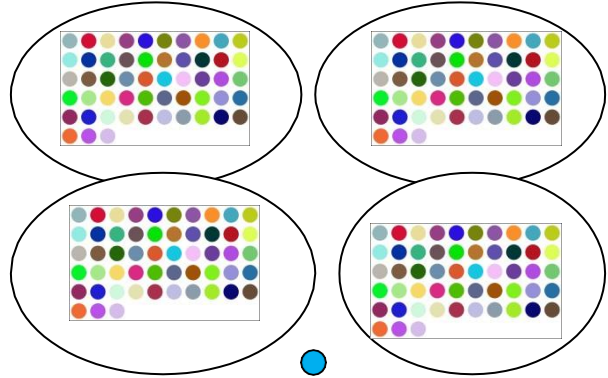
identify common factors, common multiples and prime numbers

use their knowledge of the order of operations to carry out calculations involving the 4 operations

Division with remainders

$$213 \div 4 = 53 \text{ r } 1$$

Divide objects between groups and see how much is left over



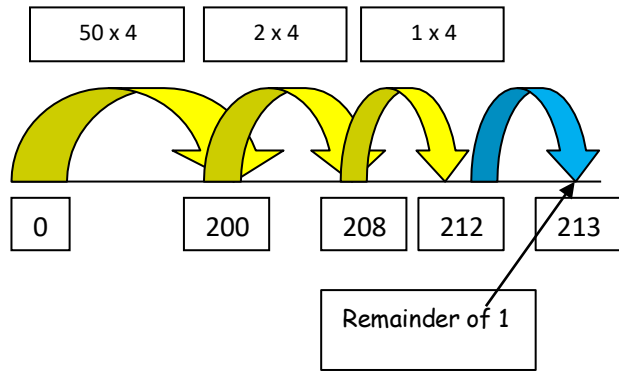
Remainder

Division

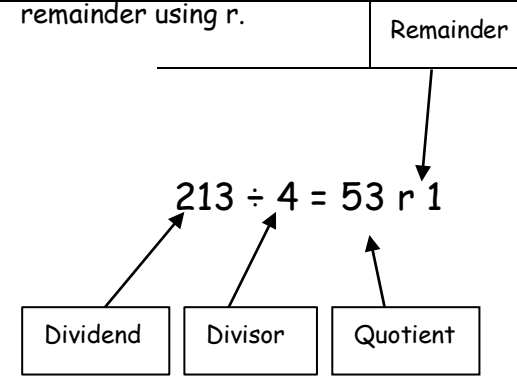
$$213 \div 4 = 53 \text{ r } 1$$

Use of numberline with a partial multiplication facts table:

Coin	X4
1	4
2	8
5	20
10	40
20	80
50	200



Complete written divisions and show the remainder using r.

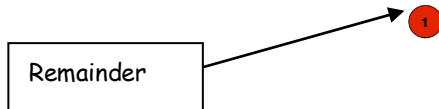


Short division with remainders

$$4564 \div 3 =$$

Use of counters and a place value grid to divide 4564 by 3

TH	H	T	O
1000	100 100 100 100 100	10	1
1000	100 100 100 100 100	10 10	1
1000	100 100 100 100 100	10 10	1



$$4564 \div 3 =$$

Children draw counters on a place value grid to divide 1264 by 3 = 1521 r1

TH	H	T	O
1000	100 100 100 100 100	10	1
1000	100 100 100 100 100	10 10	1
1000	100 100 100 100 100	10 10	1

Remainder

Move onto divisions with a remainder. Once children understand remainders, begin to express as a fraction or decimal according to the context.

$$3 \overline{)4564} \begin{array}{l} 1521 \\ \underline{4563} \\ 1 \end{array} \text{ r}1$$

Long division

$$432 \div 15$$

Long division

432 ÷ 15 becomes

$$\begin{array}{r} 28 \text{ r}12 \\ 15 \overline{)432} \\ \underline{300} \\ 132 \\ \underline{120} \\ 12 \end{array}$$

Answer: 28 remainder 12

432 ÷ 15 becomes

$$\begin{array}{r} 28 \\ 15 \overline{)432} \\ \underline{300} \quad 15 \times 20 \\ 132 \\ \underline{120} \quad 15 \times 8 \\ 12 \end{array}$$

$$\frac{12}{15} = \frac{4}{5}$$

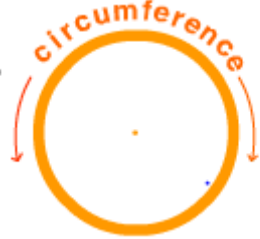
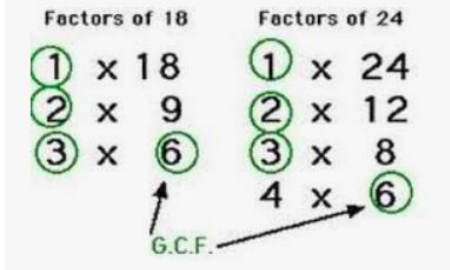
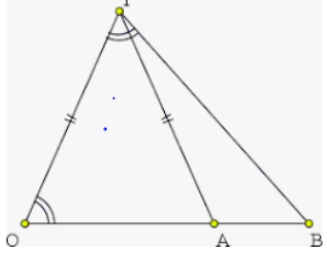
Answer: $28 \frac{4}{5}$

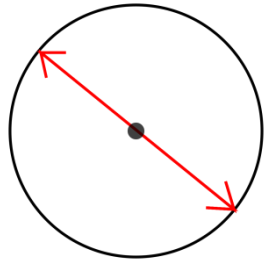
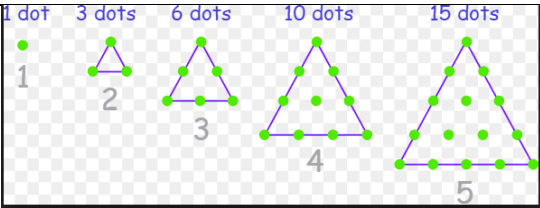
432 ÷ 15 becomes

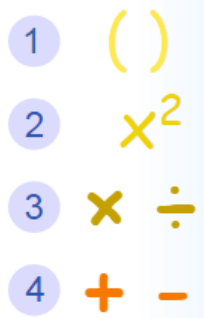


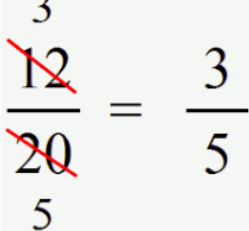
$$\begin{array}{r} 28.8 \\ 15 \overline{)432.0} \\ \underline{300} \\ 132 \\ \underline{120} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

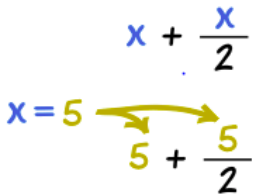

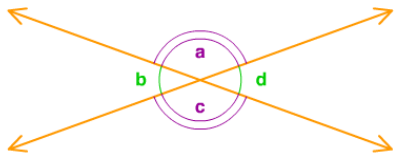
Answer: 28.8

Examples from National Curriculum Appendix

Vocabulary	Definition	Representation												
Circumference	The distance around the outside of a circle													
Common factors	A whole number that divides two (or more) numbers exactly E.G. 2 is a factor of 4, and 8													
Common multiples	A multiple that is shared by two or more numbers. E.G: 12 is a multiple of 2 and 6.	<p>Example: What is the LCM of 10 and 30?</p> <table border="0" data-bbox="1590 774 2072 909"> <tr> <td>10 x 1 = 10</td> <td>30 x 1 = 30</td> </tr> <tr> <td>10 x 2 = 20</td> <td>30 x 2 = 60</td> </tr> <tr> <td>10 x 3 = 30</td> <td>30 x 3 = 90</td> </tr> <tr> <td>10 x 4 = 40</td> <td></td> </tr> <tr> <td>10 x 5 = 50</td> <td></td> </tr> <tr> <td>10 x 6 = 60</td> <td></td> </tr> </table> <p>So the least common multiple of 10 and 30 is 30.</p>	10 x 1 = 10	30 x 1 = 30	10 x 2 = 20	30 x 2 = 60	10 x 3 = 30	30 x 3 = 90	10 x 4 = 40		10 x 5 = 50		10 x 6 = 60	
10 x 1 = 10	30 x 1 = 30													
10 x 2 = 20	30 x 2 = 60													
10 x 3 = 30	30 x 3 = 90													
10 x 4 = 40														
10 x 5 = 50														
10 x 6 = 60														
Construct	To draw a shape, line or angle accurately using a compass													
Degree of accuracy	The degree of accuracy is a measure of how close and correct a stated value													

	is to the actual, real value being described	
Diameter	The distance across the middle of the circle.	
Mean	The average of a numerical set of data. It is calculated by adding up all of the amounts within the set of data and dividing your total by the amount of numbers added.	$\frac{M + E + A + N}{4}$
Number sequence	A list of numbers that is linked by a rule.	

<p>Order of operations</p>	<p>BODMAS</p>	 <p>1 () 2 x² 3 × ÷ 4 + -</p>
<p>Pie Chart</p>	<p>A graph using a divided circle where each section represents part of the total.</p>	
<p>Radius</p>	<p>The distance from the edge of the circle to the centre.</p>	
<p>Simplify</p>	<p>Reduce the numerator and denominator in a fraction by dividing both by the same whole number.</p>	 <p>$\frac{\cancel{12}^3}{\cancel{20}_5} = \frac{3}{5}$</p>

<p>Substitute</p>	<p>In algebra, put numbers where the letters are.</p>	
<p>Symbol</p>	<p>A pattern or image used instead of words.</p>	
<p>Variables</p>	<p>A quantity that can change or vary taking on different values.</p>	<p>Variables</p>
<p>Vertically opposite angles</p>	<p>A pair of angles directly opposite each other.</p>	 <p>a and c are vertically opposite angles b and d are vertically opposite angles</p>