

St Peter's Catholic Primary School

Calculation Policy

July 2020

Intent

At St Peter's we promote a love of mathematics. We support children in exploring mathematical ideas and concepts to promote lifelong learning with number. We encourage the children to become confident and competent mathematicians who are able fluent working with number and are able to reason and solve problems within real life contexts.

Implementation

Each of the four operations (addition, subtraction, multiplication and division) is explored throughout the school following a Concrete, Pictorial and Abstract approach.

Concrete – Children use concrete objects and manipulatives to help them understand and explain what they are doing.

Pictorial – Children build upon this concrete approach by using pictorial representations which can be used to aid reasoning and problem solving.

Abstract – With a secure foundation of knowledge firmly in place, children can move on to an abstract approach using numbers and key concepts with confidence.

This policy is linked to the White Rose Schemes of Learning which is followed throughout the school and directly covers the National Curriculum for number and calculation.

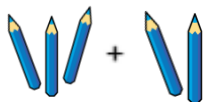
	EYF\$ / Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
ADDITION	<p>Adding groups – using different representations</p> <p>Finding one more</p> <p>Starting at the bigger number and counting on.</p> <p>Regrouping to make 10 using ten frame – numicon / cubes</p>	<p>Combining two parts to make a whole using the part whole model.</p> <p>Add by counting on.</p> <p>Add by making 10</p>	<p>Adding three single digits.</p> <p>Use of base 10 to combine two numbers. Represent base 10 in lines and dots</p> <p>Whole part whole model</p> <p>Partition 2-digit numbers</p> <p>Expanded column method.</p>	<p>Column method - regrouping.</p> <p>Using place value counters (up to 3 digits).</p>	<p>Column method - regrouping. (up to 4 digits)</p> <p>Using place value counters (up to 4 digits).</p> <p>Add decimals with up to 2 decimal places</p>	<p>Column method – regrouping (with numbers with more than 4-digits)</p> <p>Add decimals with 2 decimal places.</p>	<p>Column method - regrouping - to add several numbers of increasing complexity</p> <p>Add any decimal numbers with up to 3 decimal places.</p>
SUBTRACTION	<p>Comparing unequal groups - finding the difference</p> <p>Finding one less</p> <p>Counting back</p> <p>Part Whole Model</p>	<p>Taking away 1 / 2 digit numbers</p> <p>Counting back</p> <p>Find the difference</p> <p>Part whole model</p> <p>Make 10 using the ten frame</p>	<p>Subtract up to 2 digit numbers from 3-digit numbers</p> <p>Counting back</p> <p>Find the difference</p> <p>Part whole model</p> <p>Make 10 Use of base 10</p>	<p>Column method with regrouping.</p> <p>(up to 3 digits using place value counters)</p>	<p>Column method with regrouping. (up to 4 digits using place value counters)</p> <p>Column method with decimals with up to 2 decimal places</p>	<p>Column method with regrouping (with at least 4-digit numbers)</p> <p>Column method for decimals- with the same amount of decimal places.</p>	<p>Column method with regrouping (with increasing large and more complex numbers)</p> <p>Column method for decimals with up to 2 decimal places in the context of money and measures</p>
MULTIPLICATION	<p>Recognising and making equal groups.</p> <p>Making doubles</p>	<p>Recognising and making equal groups.</p> <p>Use arrays to multiple single digits</p> <p>Counting in multiples of 2, 5 and 10.</p> <p>Repeated addition on a number line</p>	<p>Arrays- showing commutative multiplication (2-digit number by a single digit number)</p> <p>Use repeated addition on a number line to multiply.</p>	<p>Arrays, number line and grid method.</p> <p>(2-digit \times 1-digit using place value counters and base 10)</p>	<p>Grid method.</p> <p>Column multiplication- introduced with place value counters.</p> <p>(2 and 3-digit multiplied by 1 digit)</p>	<p>Column multiplication</p> <p>Short multiplication 4-digit \times 1-digit numbers</p> <p>Long Multiplication 4-digit \times 2-digit numbers</p>	<p>Column multiplication</p> <p>Multi-digit numbers up to 4 digits by a 2-digit number.</p> <p>Decimal number with up to two decimal places multiplied by a 1-digit number.</p>
DIVISION	<p>Find half of a number.</p> <p>Sharing – make equal groups.</p> <p>Use a variety of representations</p>	<p>Sharing objects into groups</p> <p>Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups?</p> <p>Use a variety of representations.</p>	<p>Division as grouping / sharing</p> <p>Division within arrays- linking to multiplication</p> <p>Repeated subtraction</p>	<p>Division with a remainder- using arrays and a number line (grouping)</p> <p>2-digit divided by 1-digit using base 10 or place value counters</p>	<p>Division with a remainder</p> <p>Short division (up to 3 digits by 1 digit- concrete and pictorial)</p>	<p>Division using arrays (place value counters)</p> <p>Short division</p> <p>(up to 4 digits by a 1-digit number including remainders)</p>	<p>Bus Stop method for division (long / short) with at least 4-digit numbers by 1-digit or 2-digit numbers (including decimals and quantities)</p> <p>Give remainders as fractions and decimals.</p>

Addition

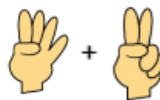
Adding groups – using different representations



$3 + 2 = 5$



$3 + 2 = 5$

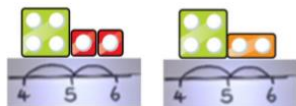


$4 + 2 = 6$

Starting at the bigger number and counting on.

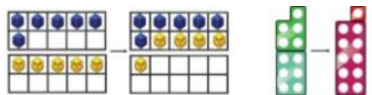


using cubes $4 + 2 = 6$

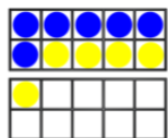


using numicon $4 + 2 = 6$

Regrouping to make 10 using ten frame – numicon / cubes



$6 + 5 = 11$



Children to draw the 10 frame - counters / cubes

Subtraction

Comparing unequal groups - finding the difference



2 cakes
 $5 - 3 = 2$



3 stripes
 $8 - 5 = 3$

Finding one less- within 5



use numicon
 $5 - 1 = 4$

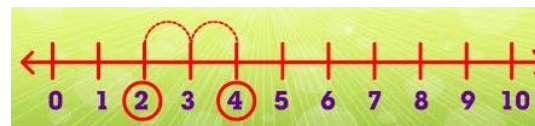


use cubes
 $3 - 1 = 2$



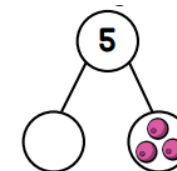
use a frame
 $4 - 1 = 3$

Counting back



Use a number line to count back 2 less than 4 is 2
 $4 - 2 = 2$

Part Whole Model



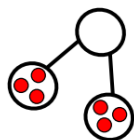
$5 - 3 = 2$

Multiplication

Recognising and making equal groups.



2 lots of 2 is 4



2 lots of 3 is 6

Make pairs of doubles



Double 3 is 6



Double 4 is 8

Division

Halving – find half of a number



Half of 4 is 2



Half of 6 is 3

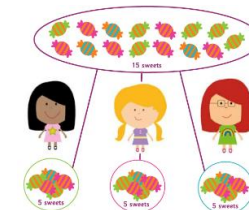
Sharing – make equal groups



6 split into groups of 2

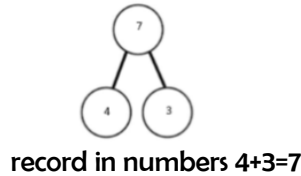
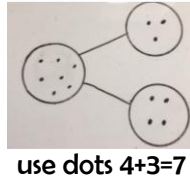
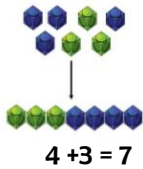


6 into 2 groups

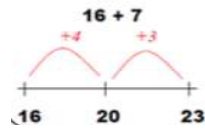
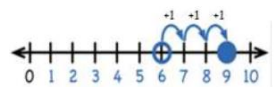
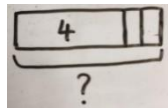


Addition

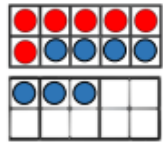
Combining two parts to make a whole using the part whole model.



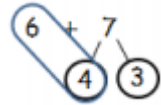
Add by counting on



Add by making 10



$6 + 7 = 13$
Use number bonds
Split 7 into 4 (to make 10) then 3 more.



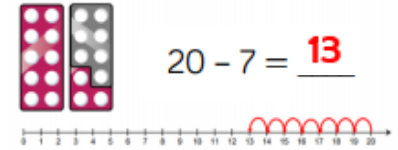
$6 + 7 = 13$
 $10 + 3 = 13$

Subtraction

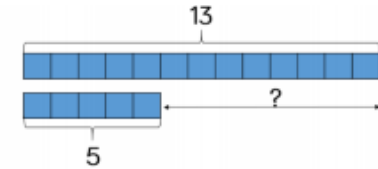
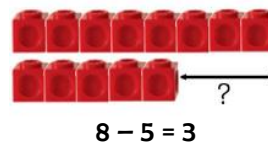
Taking away 1 / 2 digit numbers



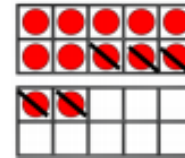
Counting back



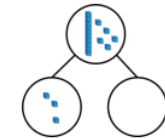
Find the difference



Make 10 using the ten frame



Part whole model



$15 - \underline{\quad} = 3$
 $15 - 3 = \underline{\quad}$
 $3 + \underline{\quad} = 15$
 $\underline{\quad} + 3 = 15$

Multiplication

Recognising and making equal groups



How many apples?
 $5 + 5 + 5 + 5 = 20$
 $5 \times 4 = 20$

Arrays to multiple single digits

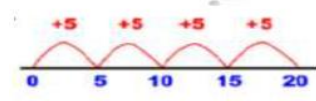


$5 \times 2 = 10$
 $2 \times 5 = 10$

Counting in multiples of 2, 5 and 10. Repeated addition on a number line



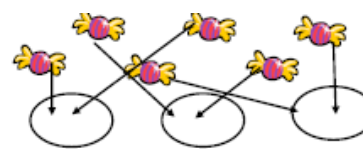
$10 \times 3 = 30$
 $10 + 10 + 10 = 30$



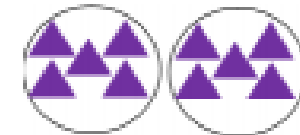
$5 + 5 + 5 + 5 = 20$
 $5 \times 4 = 20$

Division

Grouping – make equal groups to divide



$6 \div 3 = 2$



$10 \div 2 = 5$

Sharing – share in to equal groups

Share 6 into 2 equal groups



$6 \div 2 = 3$

Share 8 muffins equally on to 2 plates



8 cakes shared equally in to 2 is 4

$8 \div 2 = 4$

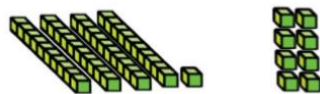
Addition

Adding three single digits.



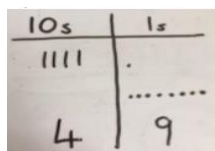
$$3+4+7 = 3+7 = 10 + 4 = 14$$

Use base 10 to combine two numbers



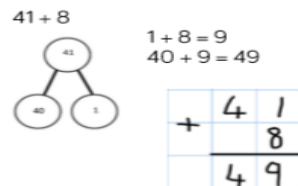
$$41 + 8 = 49$$

Represent base 10 in lines and dots

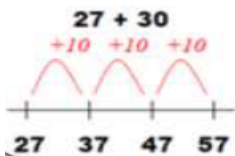


$$41 + 8 = 49$$

Whole part whole

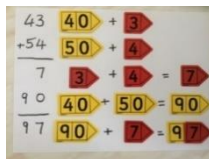


Number line



Partition two 2-digit numbers Expanded column

$$\begin{aligned} 53 + 29 \\ 50 + 20 = 70 \\ 3 + 9 = 12 \\ 70 + 12 = 84 \end{aligned}$$



Subtraction

Subtract up to 2 digit numbers from 3-digit numbers



$$26 - 18 =$$

Counting back



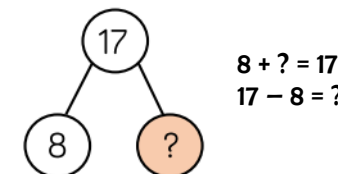
$$22 - 7 = 15$$

Find the difference



$$26 - 8 = 18$$

Part whole model

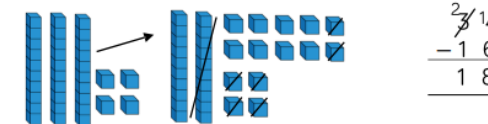


Make 10 Use of base 10 and introduce column Method

Subtract 13 from 28

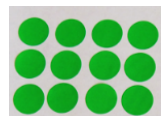


Take 16 away from 34



Multiplication

Arrays- showing commutative multiplication



$$\begin{aligned} 3 \times 4 &= 12 \\ 4 \times 3 &= 12 \end{aligned}$$



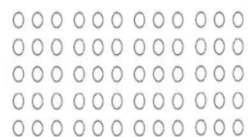
$$4 + 4 + 4 = 12$$



$$\begin{aligned} 2 \times 6 &= 12 \\ 6 \times 2 &= 12 \end{aligned}$$

$$6 + 6 = 12$$

2-digit number by a 1 digit number



$$\begin{aligned} 4 \times 3 &= 12 \\ 3 \times 4 &= 12 \end{aligned}$$

$$3 + 3 + 3 + 3 = 12$$

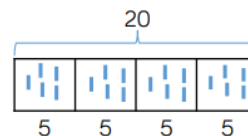
Repeated addition – number line



$$\begin{aligned} 2 \times 5 &= 10 \\ 5 \times 2 &= 10 \end{aligned}$$

Division

Division as grouping / sharing



$$20 \div 4 = 5$$



$$40 \div 10 = 4$$

Division within arrays- linking to multiplication

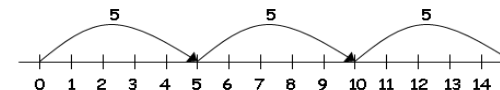


$$30 \div 3 = 10$$

$$10 \times 3 = 30$$

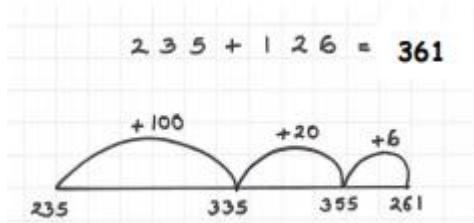
Repeated subtraction

$$5 \times 3 = 5 + 5 + 5$$

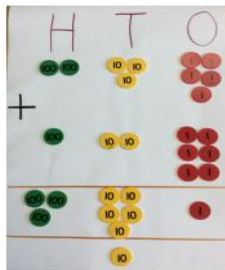


Addition

Number line (up to 3-digits)



Using place value counters (up to 3 digits).



Expanded column method - regrouping.

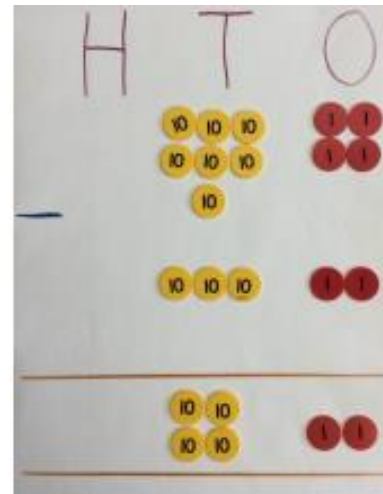
$$\begin{array}{r} 235 \\ + 74 \\ \hline 309 \\ + 100 \\ \hline 309 \end{array}$$

Compact column method (up to 3 digits).

$$\begin{array}{r} 235 \\ + 74 \\ \hline 309 \\ \hline \end{array}$$

Subtraction

Column method with regrouping using place value counters (up to 3-digits)



Partitioned column method

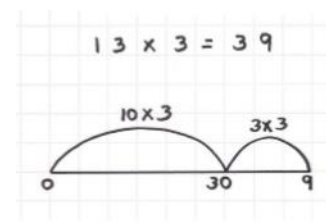
$$\begin{array}{r} 74 - 32 = 70 \quad 4 \\ - 30 \quad 2 \\ \hline 40 + 2 = 42 \end{array}$$

Compact column method

$$\begin{array}{r} 74 \\ - 32 \\ \hline 42 \end{array}$$

Multiplication

Use a number line



Place Value Counters



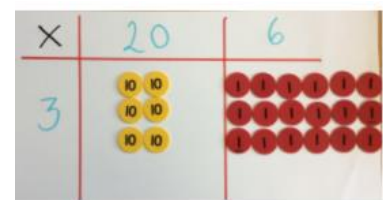
Using base 10

Tens	Ones
1	3
3	9

$$24 \times 4 = 96$$

Grid method

$$\begin{array}{r} 26 \times 3 = 78 \\ \times 20 \quad 6 \\ \hline 360 \quad 18 = 60 \\ + 18 \\ \hline 78 \end{array}$$

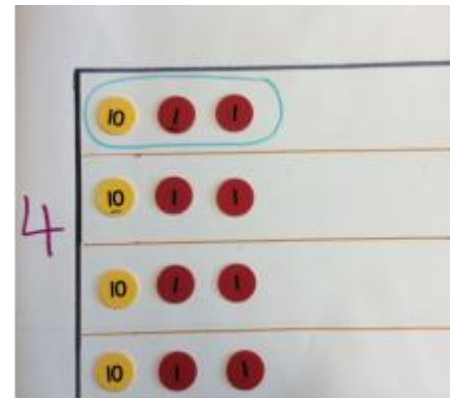


$$26 \times 3 = 78$$

Division

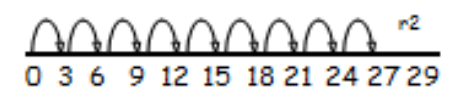
Using arrays – Place value counters

$$48 \div 4 = 12$$

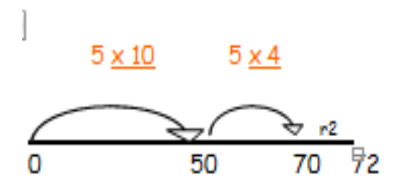


Number line - grouping

$$29 \div 3 = 9 \text{ r}2$$

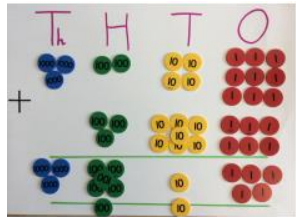


$$72 \div 5 = 14 \text{ r}2$$

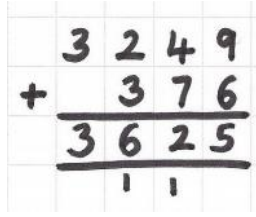


Addition

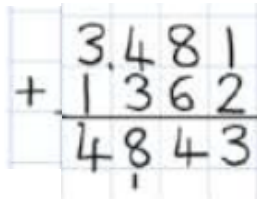
Using place value counters



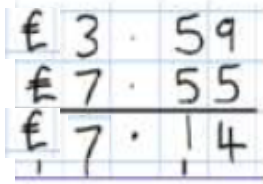
Compact column method



Column method – regrouping (up to 4 digits)

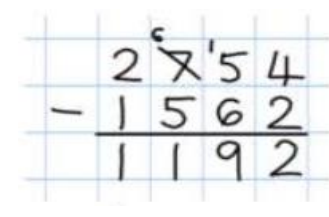
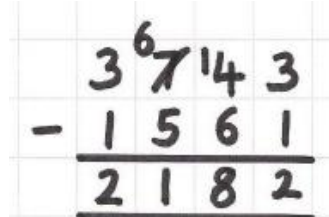


Column method to decimals up to 2dp

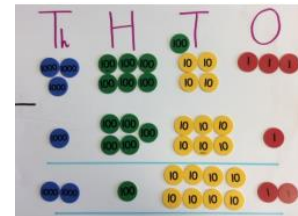


Subtraction

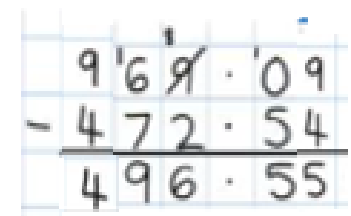
Column method with regrouping. (up to 4 digits)



Use place value counters

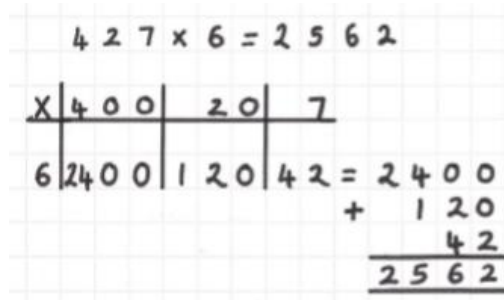


Column method with up to 2 decimal places

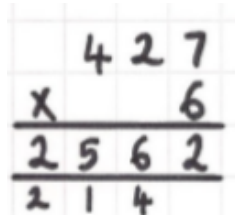


Multiplication

Grid method 2 and 3-digit numbers by 1-digit



Short multiplication



Place Value Counters

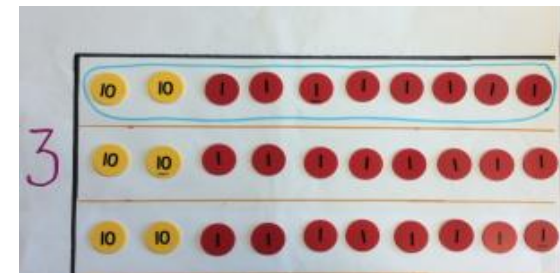
$23 \times 6 = 138$



Division

Division using arrays (Place Value Counters)

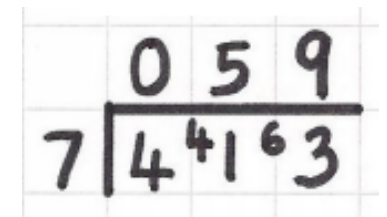
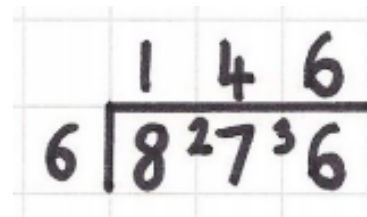
$84 \div 3 = 28$



Short Division

$876 \div 6 = 146$

$413 \div 7 = 59$



Addition

Compact column method for numbers with more than 4-digits

$$\begin{array}{r} 39502 \\ + 8794 \\ \hline 48296 \end{array}$$

$$\begin{array}{r} 23481 \\ + 1362 \\ \hline 24843 \end{array}$$

Column method to add any decimals with up to 2 decimal places

$$\begin{array}{r} £23.59 \\ £ 7.55 \\ \hline £31.14 \end{array}$$

$$\begin{array}{r} £ 42.59 \\ + £ 7.67 \\ \hline £50.26 \end{array}$$

Subtraction

Compact column method with at least 4-digit numbers

$$\begin{array}{r} 231213 \\ - 4158 \\ \hline 27889 \end{array}$$

$$\begin{array}{r} 281086 \\ - 2128 \\ \hline 28928 \end{array}$$

Column method for decimals- with the same amount of decimal places.

$$\begin{array}{r} 7169.0 \\ - 372.5 \\ \hline 6796.5 \end{array}$$

$$\begin{array}{r} 78168.0 \\ - 473.5 \\ \hline 7695.5 \end{array}$$

Multiplication

Short multiplication
4-digit x 1-digit

$$\begin{array}{r} 4562 \\ \times 7 \\ \hline 31934 \end{array}$$

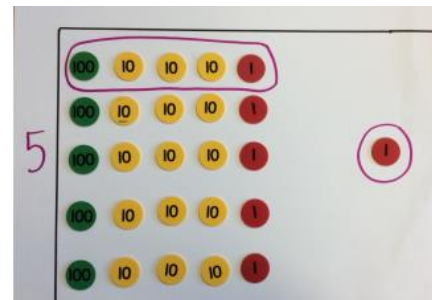
Long Multiplication
4-digit x 2-digit

$$\begin{array}{r} 1324 \\ \times 16 \\ \hline 7944 \\ + 13240 \\ \hline 21184 \end{array}$$

Division

Division using arrays (Place value counters)

$$656 \div 5 = 131 \text{ r}1$$



Short Division

$$4935 \div 8 = 616 \text{ r}7$$

$$\begin{array}{r} 0616 \text{ r}7 \\ 8 \overline{)4935} \end{array}$$

Addition

Compact column method to add several numbers of increasing complexity

$$\begin{array}{r} 82409 \\ + 20071 \\ \hline 7690 \\ \hline 4142 \\ \hline 114312 \\ \hline 1121 \end{array}$$

$$\begin{array}{r} 81,059 \\ 3,668 \\ \hline 15,301 \\ + 20,551 \\ \hline 120,579 \\ \hline 1111 \end{array}$$

Column method to add any decimal numbers with up to 3 decimal places

$$\begin{array}{r} 23.361 \\ 9.080 \\ 59.770 \\ + 1.300 \\ \hline 93.511 \\ \hline 212 \end{array}$$

$$\begin{array}{r} 26.381 \\ + 9.080 \\ 4.770 \\ 2.600 \\ \hline 42.831 \\ \hline 212 \end{array}$$

Multiplication

Short multiplication 4-digit x 1-digit

$$\begin{array}{r} 4562 \\ \times 7 \\ \hline 31934 \\ \hline 3341 \end{array}$$

Long Multiplication 4-digit x 2-digit

$$\begin{array}{r} 1324 \\ \times 16 \\ \hline 7944 \\ + 13240 \\ \hline 21184 \\ \hline 11 \end{array}$$

Multiply decimal numbers with up to 2 decimal places by a 1-digit number

$$\begin{array}{r} 4.29 \\ \times 8 \\ \hline 34.32 \\ \hline 327 \end{array}$$

Subtraction

Subtract with increasing large and more complex numbers

$$\begin{array}{r} 28,928 \\ - 2128 \\ \hline 28,928 \end{array}$$

$$\begin{array}{r} 98689 \\ - 98689 \\ \hline 007109 \end{array}$$

Compact method with decimal numbers with up to 2 decimal places including in the context of money and measures

$$\begin{array}{r} 6796.5 \\ - 372.5 \\ \hline 6796.5 \end{array}$$

$$\begin{array}{r} 159.328 \text{ kg} \\ - 47.090 \text{ kg} \\ \hline 159.328 \text{ kg} \end{array}$$

Division

Long Division (up to 4-digit number by a 2-digit number)

$$432 \div 15 = 28 \text{ r}12$$

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

Short Division (up to 4-digit by a 2-digit number)

$$6497 \div 8 = 812.125$$

$$\begin{array}{r} 0812.125 \\ 8 \overline{) 6497.000} \\ \underline{64} \\ 97 \\ \underline{96} \\ 100 \\ \underline{96} \\ 40 \\ \underline{40} \\ 000 \\ \underline{000} \\ 000 \end{array}$$

Give remainders as fractions and decimals