Written Calculation Policy

We show our love for Jesus in all we do and say.
Celebrate our gifts and our talents
As we enjoy learning and playing together.
We try to follow the example of St Patrick within our school
Community.

Policy reviewed: Summer 2022
Next Policy review due: Summer 2024

Curriculum Provision

At St Patrick's Catholic Primary School, we are committed to providing the best possible provision for children of all abilities. We plan our teaching and learning so that each child can aspire to the highest level of personal achievement. Our teachers plan carefully to meet the learning needs of all our children. We give all children the opportunity to show what they know, understand and can do, and we achieve this in a variety of ways when planning for children's learning.

Our aims are to:

• Provide a high quality curriculum and effective teaching

• Provide opportunities to extend and challenge pupils through mastery tasks

• Ensure that all children achieve their full potential

• Provide a range of activities which provide enrichment in all areas of the curriculum.

Equal opportunities and Inclusion

Maths plays an important part in the life of our school. Children are able to enjoy and achieve. It is available to every child and all children take part in a range of activities, making a positive contribution to the life of the school and local community.

Activities both within and outside the classroom are planned in a way that encourages full and active participation by all children, matched to their knowledge, understanding and previous experience.

Children have equal opportunities to develop their understanding and enjoyment of Maths regardless of ethnicity, race, gender and ability. Every effort is made to ensure that activities are equally interesting to all genders.

At St Patrick's Catholic Primary School, we value all cultures; our teachers ensure that all pupils have access to resources that do not contain race, ethnicity or gender stereotypes. Teachers ensure that the curriculum is appropriate for the needs of all children.

St Patrick's Catholic Primary School - Whole School Approach

Our calculation policy will identify the preferred methods of both mental and written calculations for our school. This will ensure consistency and progression of methods throughout the school, from the onset at Foundation through to Year 6. It will contain the key calculations/methods that will be taught within the school, by all members of staff to ensure we are approaching Mathematics holistically.

Content
The policy will be organised into two sections; addition/subtraction and multiplication/division, due to these being the inverse operations of one another. The policy will be set out in stages, rather than year groups, to enable accelerated progression where needed be but also to support children that may need further explanation of key methods. The children should move from one stage to the next when they are confident and have a solid understanding.

Aims
Children need to be able to choose an appropriate method that they can use effectively and efficiently for each operation when carrying out a given task whether it's a clear calculation or a word problem.

Duration of lesson
Key Stage 1- minimum of 45 minutes a day
Key Stage 2- minimum of an hour a day

Reasons for using written methods
- To aid mental calculation by writing down some of the numbers and answers involved.
- For children to identify where misconceptions have occurred and how to put them right.
- To give children the chance to understand and explain the method they are using.
- To aid calculation when the problem is too difficult for a mental strategy to take place.
- To provide a record of work that children have completed.
- To develop and refine a set of rules for each operation.

Non-Negotiable
- When using the column method for subtraction, the children must be told to **'exchange'** for ones, tens or hundreds, **not to 'borrow'.**
- Units are now called **'ones'.**

- When multiplying or dividing by 10, 100 or 1000 we **must** tell the children that the **numbers move a place value**, not that the decimal point moves! Nor should the children be taught that they should add a zero when multiplying by ten; they will not understand the concept of place value and may miscalculate when multiplying decimal numbers.

Always encourage the children to do the following:

- Use the appropriate mathematical language (a guide on the language will be attached)
- Estimate first
- Check the answer, preferably using a different method e.g. the inverse operation
- Show their working out where possible
- Decide first whether a mental method is appropriate
- Pay attention to language - refer to the actual value of digits
- Children who make persistent mistakes should return to the method that they can use accurately until ready to move on
- Learn key number and multiplication facts by heart
- Discuss errors, diagnose problem and revisit mistakes
- When revising or extending to harder numbers, refer back to known methods as this equips children with the confidence to apply knowledge

To be fully competent at written calculations children should have a secure understanding of the following:

Number recognition

- Identify odd and even numbers
- To know place value to 3 digits
- Partition a 3 digit number into hundreds, tens and ones
- Double and halve
- Bridge 10

Addition and Subtraction

- Addition and Subtraction facts to 20 and 100

- Count to and across 100, forwards and backwards, beginning with 0 or one, or from any given numbers.
- Identify one more and one less
- Add 3 single digit numbers
- Add and subtract any pair of two digit numbers mentally
- Mentally do the following-
  3 digit + 1 digit
  3 digit + 2 digit
  3 digit + 3 digit
  3 digit - 1 digit
  3 digit - 2 digit
  3 digit - 3 digit

Multiplication and Division

- Count in multiples of 2, 5 and 10.
- Count in multiples of 3, 4, 8, 50 and 100.
- Count in multiples of 6, 7, 9, 25 and 1,000.
- To know the result when multiplying by 0 or 1.
- To understand 0 as a place holder.
- To be able to mentally double and halve two digit numbers.
- Multiply 2 and 3 digit numbers by 10 and 100.
- Use multiplication facts that they know to derive other multiplication facts e.g. 13 x 9 = 10 x 9 + 3 x 9 = 90 + 27 = 117
- To be able to explain their mental strategy using informal jottings.

To develop children's understanding of Maths, it is important that the use of questioning is embedded throughout all lessons, to enable children to discuss and justify their methods, using mathematical vocabulary. This can be developed further through children's problem solving and reasoning activities.

Adding and Subtracting

Count in ones

Add ones	Subtract ones by crossing out

+ = 5

7 – 2 = 5

5 ladybirds are left.

7 – 2 is equal to 5.

7 – 2 = 5 is a subtraction equation.
We read it as seven minus two equals five.

Add ones using number bonds	Subtract ones using number bonds

part
4
whole
6
part
2

4 + 2 = 6
part   part   whole

Subtract by Using Number Bonds

4 – 3 = 1
whole part part

1 boy does not wear glasses.

3
4
1

How many boats are not red?

Add ones by counting on	Subtract ones by counting back
6 + 3 = ? 6 + 3 = 9 There are 9 buttons in total.	8 − 3 = ? Count back 3 steps from 8. 8 − 3 = 5 There are 5 books in the bag.
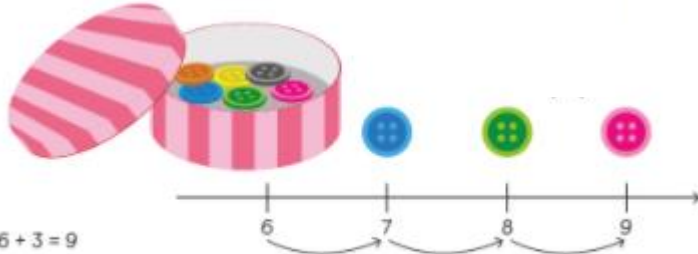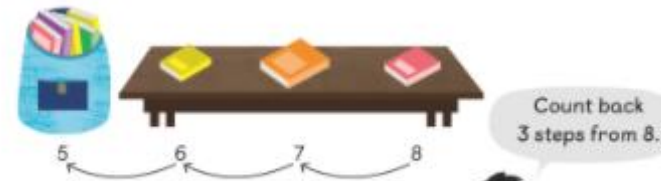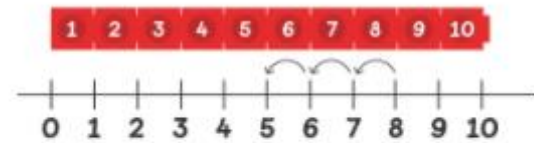
Number fact (fact families) representation to 10
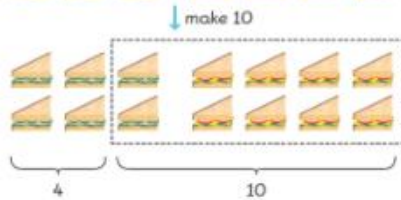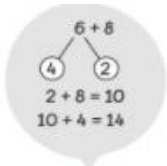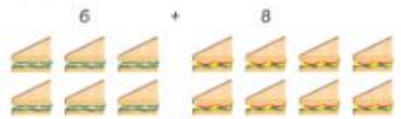
Tens Frame	Part Whole Model	Bar Model
6 + 4 = 10 4 + 6 = 10 10 − 4 = 6 10 − 6 = 4	6 + 4 = 10 4 + 6 = 10 10 − 4 = 6 10 − 6 = 4	6 + 4 = 10 4 + 6 = 10 10 − 4 = 6 10 − 6 = 4

Number fact (fact families) to 20

Number fact (fact families) to 100

Add by making ten (bridging 10)

1. 6 + 8 = ?

$6 + 8$

$2 + 8 = 10$
$10 + 4 = 14$

make 10

4   10
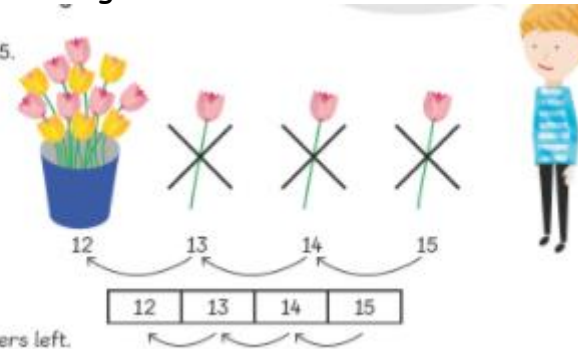
$6 + 8 = 14$
There are 14 sandwiches.

Subtract by counting back

Subtract 3 from 15.

12   13   14   15

$15 - 3 = 12$

There are 12 flowers left.

| 12 | 13 | 14 | 15 |

Simple adding 2 digit + 1 digit

Add 25 and 3.

Method 1   Count on from 25.

| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
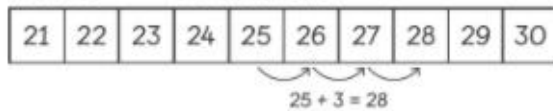
$25 + 3 = 28$

Method 2   Add ones.

2 tens   8 ones

$25 + 3 = 28$

	tens	ones
	2	5
+		3
	2	8

Subtracting 1 digit from 2 digit

Subtract 3 from 28.

Method 1   Count back from 28.

| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |

$28 - 3 = 25$

Method 2   Subtract ones.

2 tens   5 ones
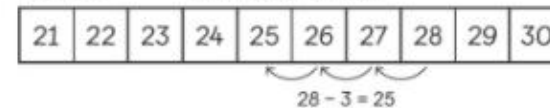
$28 - 3 = 25$

28 − 3
20   8
$8 - 3 = 5$
$20 + 5 = 25$
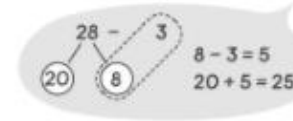
	tens	ones
	2	8
-		3
	2	5

Adding 2 digit + 1 digit (bridging 10)	Subtracting 1 digit from 2 digit by renaming/exchanging

Adding 2 digit + 1 digit (bridging 10)

	tens	ones
	2	4
+		7
	1	1
+	2	0
	3	1

Subtracting 1 digit from 2 digit by renaming/exchanging

	tens	ones
	²1 ̷2	¹³ ̷3
-		5
	1	8

Adding 2 digit + 2 digit

Method 1   Count on in tens from 19.

19 + 20 = 39

19, 29, 39

Method 2   Add the tens.

19 + 20
10 + 20 = 30
9   10   9 + 30 = 39

19 + 20 = 39

	tens	ones
	1	9
+	2	0
	3	9

Subtracting 2 digit from 2 digit

Subtract 20 from 36.

Method 1   Count back in tens from 36.

36 – 20 = 16

36, 26, 16

Method 2   Subtract tens.

36 – 20
30 – 20 = 10
6   30   6 + 10 = 16

36 – 20 = 16

	tens	ones
	3	6
-	2	0
	1	6

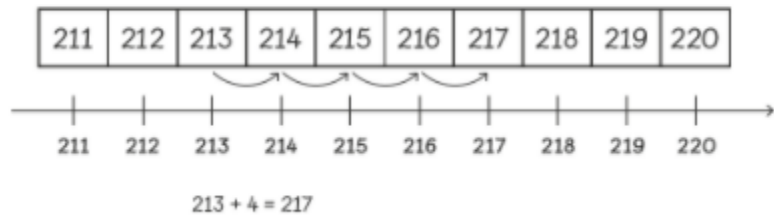| Adding 2 digit + 2 digit by renaming/carying (bridging 10)	Subtracting 2 digit from 2 digit by renaming/exchanging

tens	ones
1	5
+ 1	8
1	3
+ 2	0
3	3

tens	ones
	1
1	5
+ 1	8
3	3

tens	ones
$\overset{2}{\cancel{3}}$	$\overset{12}{\cancel{2}}$
- 1	6
1	6

Adding 3 digit + 1 digit

Add 213 and 4.

Method 1   Count on from 213.

211	212	213	214	215	216	217	218	219	220

211 212 213 214 215 216 217 218 219 220

213 + 4 = 217

Method 2   Add the ones.

add

213 + 4
210 3
3 + 4 = 7
210 + 7 = 217
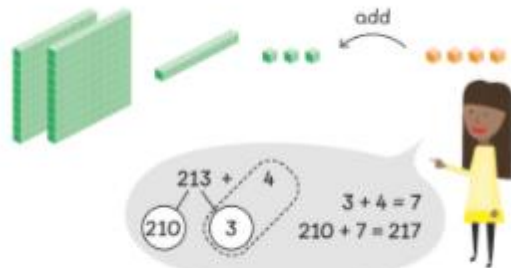
213 + 4 = 217

h	t	o
2	1	3
+		4
2	1	7

Subtracting 1 digit from 3 digit

Subtract 4 from 658.

Method 1   Count back from 658.

651	652	653	654	655	656	657	658

650 651 652 653 654 655 656 657 658
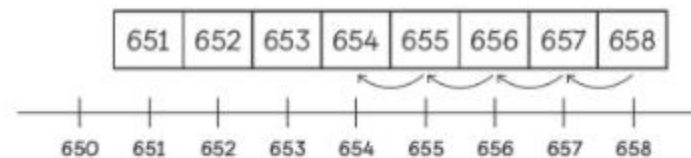
658 − 4 = 654

Method 2   Subtract ones.

658 − 4
650 8
8 − 4 = 4
650 + 4 = 654
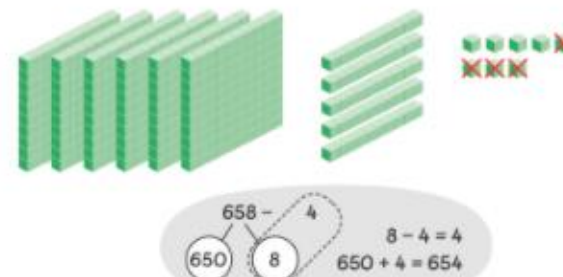
658 − 4 = 654

h	t	o
6	5	8
-		4
6	5	4

Adding 3 digit + 1 digit by renaming/carrying (bridging 10)	Subtracting 1 digit from 3 digit by renaming/exchanging

Adding 3 digit + 1 digit by renaming/carrying (bridging 10)

h	t	o
2	3	6
+		8
	1	4
	3	0
+ 2	0	0
2	4	4

h	t	o
2	3¹	6
+		8
2	4	4

Subtracting 1 digit from 3 digit by renaming/exchanging

h	t	o
2	²3̶	¹⁶6̶
-		8
2	2	8

Adding 3 digit + 2 digit

1 Add 119 and 80.
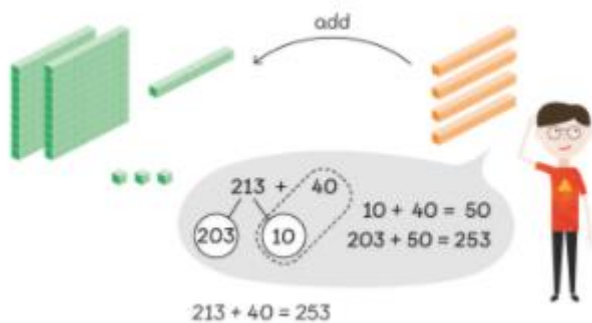
Method 1 — Count on in tens from 119.

119 + 80 = 199

119, 129, 139, 149, 159, 169, 179, 189, 199

Method 2 — Add the tens.

add

213 + 40
(203) (10)   10 + 40 = 50
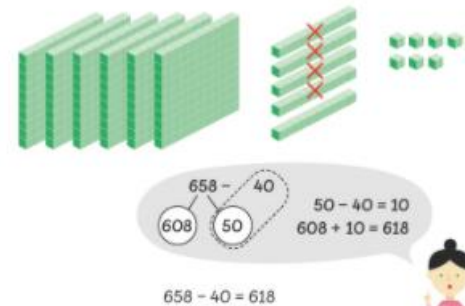   203 + 50 = 253

213 + 40 = 253

Subtracting 2 digit from 3 digit

Subtract 40 from 658.

Method 1 — Count back in tens from 658.

658 − 40 = 618

658, 648, 638, 628, 618

Method 2 — Subtract tens.

658 − 40
(608) (50)   50 − 40 = 10
             608 + 10 = 618

658 − 40 = 618
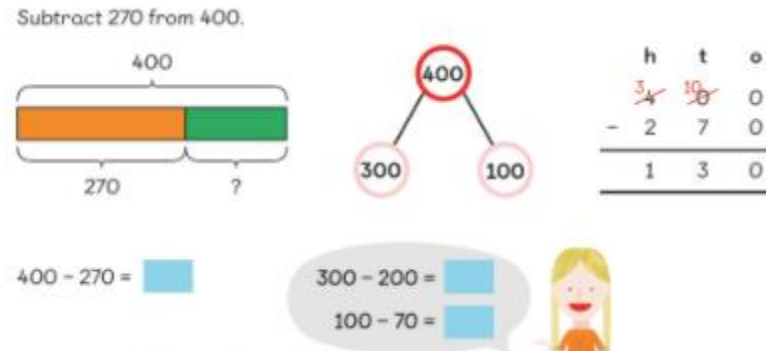
| **Adding 3 digit + 2 digit by renaming/carrying (bridging 10)**<br><br>```
      h  t  o
      6  9  2
   +     7  0
            2
      1  6  0
   +  6  0  0
      7  6  2
```<br><br>```
         1
      h  t  o
      6  9  2
   +     7  0
      7  6  2
``` | **Subtracting 2 digit from 3 digit by renaming/exchanging**<br><br>```
      h   t    o
          2    11
      8   3̶    1̶
   -      2    6
      8   0    5
``` |
| **Adding 3 digit + 3 digit**

Let's Learn   213, 313, 413, 513, 613

Add 213 and 400.

Method 1   Count on in hundreds from 213.

213 + 400 = 613 | **Subtracting 3 digit from 3 digit**

Subtract 500 from 658.

Method 1   Count back in hundreds from 658.

658 − 500 = 158   658, 558, 458, 358, 258, 158 |

Method 2   Add the hundreds.
 	
add
 	
213 + 400
13   200
200 + 400 = 600
13 + 600 = 613
 	
213 + 400 = 613
 	
Using models
 	
Add ones.
Add tens.
Add hundreds.
 	
  1 3 6
+ 2 4 5
———————
  1 1   add ones
  7 0   add tens
+ 3 0 0   add hundreds
———————
  3 8 1   sum
	Method 2 Subtract hundreds.
	
	658 – 500
	58 600
	600 – 500 = 100
	58 + 100 = 158
	
	658 – 500 = 158
	
	Using bar models
	
	Subtract 270 from 400.
	
	400
	270 ?
	
	400
	300 100
	
	  h t o
	  3 10
	  4 0 0
	– 2 7 0
	———————
	  1 3 0
	
	400 – 270 =
	
	300 – 200 =
	100 – 70 =

Adding 3 digit + 3 digit by renaming/carrying (bridging 10)	Subtracting 3 digit from 3 digit by renaming/exchanging

h	t	o
1	1	
2	7	8
+ 3	4	9
6	2	7

h	t	o
5 6	10 0	8
- 1	3	5
4	7	3

h	t	o
2 3	9 0	10 0
- 1	2	5
1	7	5

- Taught methods will continue as numbers increase to 6 digit numbers
- When confident, children may remove column identification (h,t,o)
- Children may also use the format below when subtracting once understanding is secure

h	t	o
5 6	1 0	8
- 1	3	5
4	7	3

h	t	o
2 3	9 0	1 0
- 1	2	5
1	7	5

*Struggling learners or those who do not record neatly may find it helpful to carry below the answer line when adding

Multiplication and Division

Step counting in 2s, 5s and 10s
Count in multiples of 3, 4, 8, 50 and 100.
Count in multiples of 6, 7, 9, 25 and 1,000.

Multiplication	Division
Making equal groups / Making equal rows	Grouping equally

Let's Learn

1. 3 cookies in 1 row
6 cookies in 2 rows
12 cookies in 4 rows
▢ cookies in 6 rows

6 rows of threes

6 threes

2. There are 10 toy soldiers in one row.
2 tens = 20
There are 20 toy soldiers altogether.

10, 20

There are 8 cans.

There are 4 boxes of 2 cans.

Adding equal groups	Sharing equal groups

① There are 4 trays.

Each tray has 5 🧃.

5, 10, 15, 20

4 trays of 5 = 20
4 groups of 5 = 20
4 fives = 20

There are 20 🧃 altogether.

② There are 12 toy cars.
Put the toy cars equally into 4 boxes.
How many toy cars are there in each box?

Circle to make 4 groups.

2 times tables

Making doubles

Double 2 = 4

Let's Learn

① 1 stick has 2 sausages.

1 group of 2
$1 \times 2 = 2$

2 groups of 2
$2 \times 2 = 4$

3 groups of 2
$3 \times 2 = 6$

There are 6 sausages altogether.

Dividing by grouping equally

How many bags of chocolate can Emma get?

Let's Learn

÷ means to divide.
20 ÷ 2 is equal to 10.

There are 20 chocolates.

Put 2 chocolates
in each bag.

Emma gets 10 bags of chocolate.

$20 \div 2 = 10$ is a division equation.
$20 \div 2 = 10$ is read as twenty divided by two equals ten.

5 times table

① 1 stick has 5 marshmallows.	There are 15 cookies.
1 group of 5 $1 \times 5 = 5$	$3 \times 5 = 15$ $15 \div 5 = 3$
2 groups of 5 $2 \times 5 = 10$	Put 5 cookies on each tray.
3 groups of 5 $3 \times 5 = 15$	$15 \div 5 = 3$ There are 3 trays of cookies. What if Ravi puts the 15 cookies equally on 5 trays?
There are 15 marshmallows altogether.	

Multiplying using arrays	Dividing using arrays
$9 \times 5 = $ ▢	
$10 \times 5 = 50$	Put into groups of 5.
$9 \times 5 = 50 - 5$ $= 45$	

10 times table

2 groups of 10
$2 \times 10 = 20$

10 times table using arrays

How many flowers are there?

Let's Learn

5 groups of 10
5×10

$5 \times 10 = 50$
$10 \times 5 = 50$
They are equal.

$60 \div 10 = 6$

There are 6 jars of sweets.

What if the 60 sweets are packed equally into 10 jars?

Divide using arrays

Put into groups of 10.

There are ☐ groups.

Continue with 3,4,8 times tables

Multiplying 2 digit by 1 digit by grouping	Dividing by partitioning and grouping

Multiplying 2 digit by 1 digit by grouping

Multiply 2 tens by 4
20 × 4 = 80

	t	o
	2	0
×		4
	8	0

Multiplying 2 digit by 1 digit by repeated addition

Method 1

12 + 12 + 12 + 12 = 48

There are 48 🍩 in four boxes.

Multiplying 2 digit by 1 digit by partitioning

12 × 4 = 48
10   2
10 × 4   2 × 4

	t	o
	2	3
×		2
		6
+	4	0
	4	6

	h	t	o
		2	
		4	7
×			4
	1	8	8

Dividing by partitioning and grouping

To find the number of sweets each person gets, divide 68 by 2.

68 ÷ 2 = ▢

Step 1   Divide 6 tens by 2.

6 tens ÷ 2
= 3 tens

68
60   8

6 tens ÷ 2

Step 2   Divide 8 ones by 2.

8 ones ÷ 2
= 4 ones

68
60   8

6 tens ÷ 2   8 ones ÷ 2

Step 3   Add the results.

68 ÷ 2 = 30 + 4 = 34
Each person gets 34 sweets.

Continue with 6,7,9,11,12 times tables

Multiply and divide by 10, 100, 1000

Multiply 2 digit by 1 digit

$8 \times 18 = $ ▭

```
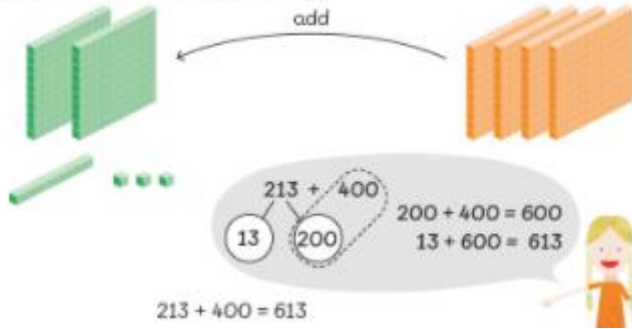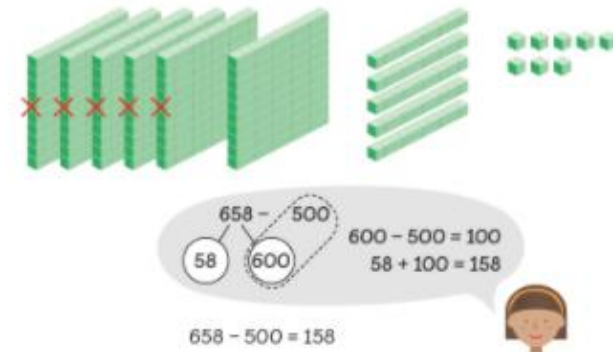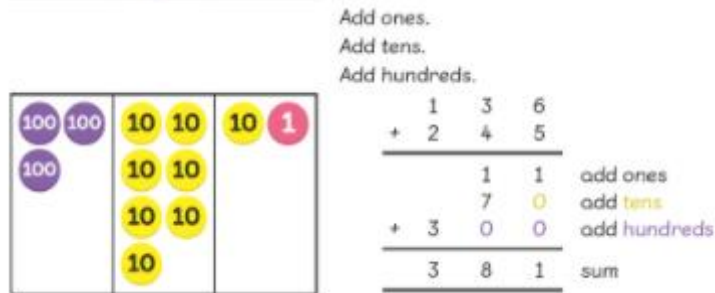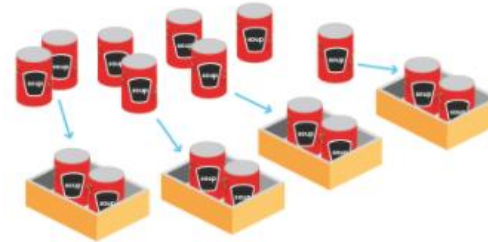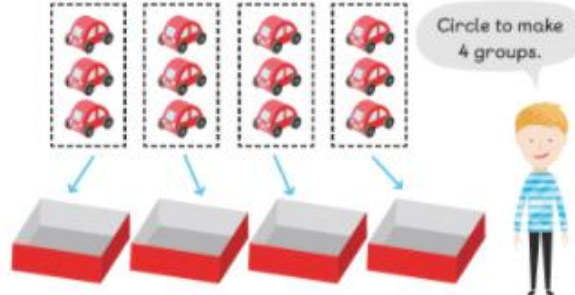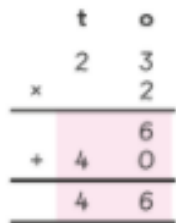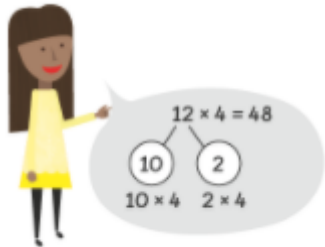  1 8
×   8
-------
  6 4  →  multiply
          by ones
+ 8 0  →  multiply
          by tens
-------
1 4 4
```

```
    4
  2 6
×   8
-------
2 0 8
```

Dividing 2 digit by 1 digit
using long division

```
    96
   /  \
  80   16
```

First, I take 80 from 96.
Then, I take 16 from
the remaining 16.

```
      1 2
8 ) 9 6
  - 8 0
  -----
    1 6
  - 1 6
  -----
      0
```

Multiply 3 digit by 1 digit

```
  1 1 8
×     3
---------
    2 4  →  multiply by ones
    3 0  →  multiply by tens
+ 3 0 0  →  multiply by hundreds
---------
  3 5 4
```

Dividing 3 digit by 1 digit(with and without remainders)

```
      930
     /   \
   900    30
    ↓      ↓
   300    10
```

```
        3 1 0
3 ) 9 3 0
  - 9 0 0  →  300
  -------
      3 0
    - 3 0  →  10
    -----
        0
```

dividing 35 tens by 5
dividing 26 ones by 5

```
      7 5   remainder 1
      5 26
5 ) 3 7 6
```

Multiply 4 digit by 1 digit

Dividing 4 digit by 1 digit using known multiplications

1 0 2 2
×   4
 	
8 → multiply by ones
8 0 → multiply by tens
0 → multiply by hundreds
+ 4 0 0 0 → multiply by thousands
 	
4 0 8 8
 	
$\overset{2\ 2\ 2}{4\ 7\ 6\ 9}$
×   3
 	
1 4 3 0 7
	2528
	⟋ ⟍
	2400 128
	⟋ ⟍
	80 48
	
	8 ⟌ 2 5 2 8
	  − 2 4 0 0
	      1 2 8
	  − 8 0
	        4 8
	  − 4 8
	          0

Multiply 2 digit by 2 digit | **Divide 2 digit by 2 digit**

2 14 × 22 = ⬜

10 10 1 1

14 × 20
= 14 × 2 tens
= 28 tens   280

14 × 2 = 28

14 × 20 = 280
14 × 2 = 28
14 × 22 = 308

14 × 22 = 308

14 × 10 = 140
14 × 2 = 28
14 × 12 = 168

$\overset{1}{}\ \overset{4}{}$
2 8
×   2 6
1 6 8 ⟶ 28 × 6
+ 5 6 ⟶ 28 × 20
7 2 8

          3
1 8 ⟌ 5 4   18
       5 4   36
          0   54

                3
1 8 ⟌ 5 4

          3 r9
1 8 ⟌ 6 3   18
       5 4   36
          9   54

Remainders presented 3 ways r9 (3r9) , 9/18 (3 ½), 0.5 (3.5)

Multiply 3 digit by 2 digit	**Divide 3 digit by 2 digit**

  132 × 12 ──── 264 → multiply by 2 + 1320 → multiply by 10 ──── 1584 2 4 5 (carries 1 1) × 13 ──── 735 → multiply by 3 + 2450 → multiply by 10 ──── 3185	 3 9 r10 1 6 ⟌ ⁵̶0̶ ¹3 4 - 4 8 ──── 1 5 4 - 1 4 4 ──── 1 0 16 32 48 64 80 96 112 128 144 160
Struggling learners or those who do not record neatly may find it more helpful to carry below the answer line when adding	Remainders presented 3 ways if known r10 (39r10) , 10/16 (39 5/8), 39.625