A

Step-by-Step Guide

to

The Four Operations

Ages 7 - 11

Key Stage 2

Supports the National Curriculum

Introduction

This Step-by-Step Guide is to enable children and adults to understand the formal written methods of The Four Operations (addition, subtraction, multiplication and division).

Prior learning is required to enable success to be achieved whilst using this Guide, in the areas of Counting, Place Value, Mathematical Comprehension, Mathematical Language and Vocabulary.

An abstract (written) format with pictorial representations has been used to breakdown each method into steps, to provide access for differing learning styles. Use of other concrete objects to aid understanding and learning is encouraged i.e. number lines, place value counters, dienes, cuisenaire, numicon, multiplication squares.

Included with this Guide is the Universal Calculation Mat, allowing the practice of the calculations in the accompanying Workbooks. This may dispel any fears of making mistakes before an independent attempt of the questions in the Workbooks.
The Universal Calculation Mat can be used for other areas of your maths learning, to practice further calculations i.e. Fractions.

Once you are feeling confident with a method within the guide, The Four Operations Workbook is provided, allowing practice of the calculations, independently.

The Times Table Quiz Workbook has been provided, to further develop multiplication and division knowledge and skills.

Reading the Glossary before using this Guide will help you gain a greater understanding of the Mathematical Language and Vocabulary being used throughout.

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3- Digit Expanded Column Addition

Step 1
In the 1s column add altogether, 7 + 5, equals 12 ones (**10** + **2**).

Step 2
Write **2 ones** in the total value of the 1s column.

Step 3
Regroup the **10 ones** in to **1 ten** to the 10s column.
Write **10** below the 80 in the 10s column.

Step 4
Now in the 10s column add altogether, 50 + 80 + **10**, equals 140 (14 tens). Write **40** (4 tens) in the total value of the 10s column.

Step 5
Regroup the **10 tens** in to **1 hundred** to the 100s column.
Write **100** below the 400 in the 100s column.

Step 6
Then in the 100s column add altogether, 200 + 400 + **100**, equals 700 (7 hundred). Write **700** in the total value of the 100s column.
Lastly add altogether the partitioned values, **700** + **40** + **2**, equals **742**.
Total value is **742**.

3- Digit Expanded Column Addition

Step 1	100s	10s	1s
	200	50	7
+	400	80	5

Step 2	100s	10s	1s
	200	50	7
+	400	80	5
			2

Step 3	100s	10s	1s
	200	50	7
+	400	80	5
		10	
			2

Step 4	100s	10s	1s
	200	50	7
+	400	80	5
		10	
		40	2

Step 5	100s	10s	1s
	200	50	7
+	400	80	5
	100	10	
		40	2

Step 6	100s	10s	1s
	200	50	7
+	400	80	5
	100	10	
	700	40	2

OR	100s	10s	1s
	2	5	7
+	4	8	5
	1	1	
	7	4	2

3- Digit Column Addition

Step 1
In the 1s column add altogether, 5 + 7, equals 12 ones (**10** + **2**).

Step 2
Write **2 ones** in the total value of the 1s column and regroup the **10 ones** in to **1 ten** to the 10s column. Write **1** below the 4 in the 10s column.

Step 3
Now in the 10s column add altogether, 3 + 4 + 1, equals **8 tens** (80). Then write **8** in the total value of the 10s column.

Step 4
Next in the 100s column add altogether, 1 + 2, equals **3 hundreds** (300). Lastly write **3** in the total value of the 100s column.
Total value is **382**.

Step 1	**100s**	**10s**	**1s**
	1	3	5
+	2	4	7

Step 2	**100s**	**10s**	**1s**
	1	3	5
+	2	4	7
		1	
			2

Step 3	**100s**	**10s**	**1s**
	1	3	5
+	2	4	7
		1	
		8	**2**

Step 4	**100s**	**10s**	**1s**
	1	3	5
+	2	4	7
		1	
	3	**8**	**2**

3- Digit Column Addition

Step 1
In the 1s column add altogether, 7 + 5, equals 12 ones (**10** + **2**).

Step 2
Write **2 ones** in the total value of the 1s column and regroup the **10 ones** in to **1 ten** to the 10s column. Write **1** below the 8 in the 10s column.

Step 3
Now in the 10s column add altogether, 5 + 8 + **1**, equals 14 tens (**100** + **40**). Then write **4 tens** in the total value of the 10s column and regroup the **10 ones** in to **1 hundred** to the 100s column. Write **1** below the 4 in the 100s column.

Step 4
Next in the 100s column add altogether, 2 + 4 + 1, equals **7 hundreds** (700). Lastly write **7** in the total value of the 100s column. Total Value is **742**.

Step 1	**100s**	**10s**	**1s**
	2	5	7
+	4	8	5

Step 2	**100s**	**10s**	**1s**
	2	5	7
+	4	8	5
		1	
			2

Step 3	**100s**	**10s**	**1s**
	2	5	7
+	4	8	5
	1	**1**	
		4	**2**

Step 4	**100s**	**10s**	**1s**
	2	5	7
+	4	8	5
	1	**1**	
	7	**4**	**2**

3- Digit Long Addition

Step 1
In the 1s column add altogether, 5 +7 + 3, equals 15 ones (**10** + **5**).

Step 2
Write **5 ones** in the total value of the 1s column.

Step 3
Regroup the **10 ones** in to **1 ten** to the 10s column.
Write **1** below the 9 in the 10s column.

Step 4
Now in the 10s column add altogether, 3 + 4 + 9 + **1**, equals 17 tens (**100** + **70**). Write **7 tens** in the total value of the 10s column.

Step 5
Regroup the **10 tens** in to **1 hundred** to the 100s column.
Write **1** below the 5 in the 100s column.

Step 6
Lastly in the 100s column add altogether, 1 + 2 + 5 + **1**, equals **9 hundreds** (900). Write **9** in the total value of the 100s column.
Total value is **975**.

3- Digit Long Addition

Step 1	100s	10s	1s
	1	3	5
	2	4	7
+	5	9	3

Step 2	100s	10s	1s
	1	3	5
	2	4	7
+	5	9	3
			5

Step 3	100s	10s	1s
	1	3	5
	2	4	7
+	5	9	3
		1	
			5

Step 4	100s	10s	1s
	1	3	5
	2	4	7
+	5	9	3
		1	
		7	5

Step 5	100s	10s	1s
	1	3	5
	2	4	7
+	5	9	3
	1	1	
		7	5

Step 6	100s	10s	1s
	1	3	5
	2	4	7
+	5	9	3
	1	1	
	9	7	5

3- Digit Expanded Column Subtraction

Step 1
In the 1s column, 5 subtract 6, you cannot do. (Discuss why not)
From the 10s column, regroup 10 from the 30 to the 1s column.
Cross out the 30 and write **20** above.

Step 2
Regroup the **1 ten** in to **10 ones** to the 1s column, **10** + 5, equals **15 ones**. Cross out the 5 ones and write **15** above.

Step 3
Now in the 1s column, **15** subtract 6, equals **9**. Write **9** in the total value of the 1s column.

Step 4
Then in the 10s column, **20** subtract 40, can't do.(Discuss why not)

Step 5
From the 100s column, regroup 100 from the 700 to the 10s column.
Cross out the 700 and write **600** above.

Step 6
Regroup the **1 hundred** in to **10 tens** to the 10s column, **100** + **20**, equals **120**. Cross out the **20** and write **120** above.

Step 7
Next in the 10s column, **120** subtract 40, equals **80** (8 tens).
Write **80** in the total value of the 10s column.

Step 8
Lastly in the 100s column, **600** subtract 200, equals **400** (4 hundreds).
Write **400** in the total value of the 100s column. Lastly add altogether the partitioned values, **400** + **80** + **9,** equals **489**. Total value is **489.**

3- Digit Expanded Column Subtraction

Step 1	100s	10s	1s
		20	
	700	~~30~~	5
-	200	40	6

Step 2	100s	10s	1s
		20	15
	700	~~30~~	~~5~~
-	200	40	6

Step 3	100s	10s	1s
		20	15
	700	~~30~~	~~5~~
-	200	40	6
			9

Step 4	100s	10s	1s
		20	15
	700	~~30~~	~~5~~
-	200	40	6
			9

Step 5	100s	10s	1s
	600	20	15
	~~700~~	~~30~~	~~5~~
-	200	40	6
			9

Step 6	100s	10s	1s
		120	
	600	~~20~~	15
	~~700~~	~~30~~	~~5~~
-	200	40	6
			9

Step 7	100s	10s	1s
		120	
	600	~~20~~	15
	~~700~~	~~30~~	~~5~~
-	200	40	6
		80	9

Step 8	100s	10s	1s
		120	
	600	~~20~~	15
	~~700~~	~~30~~	~~5~~
-	200	40	6
	400	80	9

3- Digit Column Subtraction

Step 1
In the 1s column, 5 subtract 6, you cannot do. (Discuss why not)

Step 2
From the 10s column, regroup 1 ten from the 9 tens to the 1s column. Cross out the 9 tens and write **8 tens** above.

Step 3
Now in the 1s column, regroup the **1 ten** in to **10 ones**, **10** + 5, equals **15 ones**. Cross out the 5 ones and write **15 ones** above.

Step 4
Then in the 1s column, **15** subtract 6, equals **9 ones** (9). Write **9** in the total value of the 1s column.

Step 5
Next in the 10s column, **8** subtract 4, equals **4 tens** (40). Write **4** in the total value of the 10s column.

Step 6
Lastly in the 100s column, 7 subtract 2, equals **5 hundreds** (500). Write **5** in the total value of the 100s column.
Total value is **549**.

3- Digit Column Subtraction

Step 1

	100s	10s	1s
	7	9	5
-	2	4	6

Step 2

	100s	10s	1s
		8	
	7	~~9~~	5
-	2	4	6

Step 3

	100s	10s	1s
		8	15
	7	~~9~~	~~5~~
-	2	4	6

Step 4

	100s	10s	1s
		8	15
	7	~~9~~	~~5~~
-	2	4	6
			9

Step 5

	100s	10s	1s
		8	15
	7	~~9~~	~~5~~
-	2	4	6
		4	9

Step 6

	100s	10s	1s
		8	15
	7	~~9~~	~~5~~
-	2	4	6
	5	4	9

3- Digit Column Subtraction

Step 1

In the 1s column, 4 subtract 8, you cannot do. (Discuss why not)

Step 2

From the 10s column, you cannot regroup 1 ten from the 0 tens, to the 1s column. (Discuss why not) Instead from the next place value column, the 100s, regroup 1 hundred from the 8 hundred to the 10s column. Cross out the 8 hundred and write **7 hundred** above.

Step 3

Now in the 10s column, regroup the **1 hundred** in to **10 tens**, **10** + 0, equals **10 tens**. Cross out the 0 tens and write **10 tens** above.

Step 4

Then in the 10s column, regroup 1 ten to 10 ones to the 1s column. Cross out the **10 tens** and write **9 tens** above.

Step 5

Regroup the **1 ten** in to **10 ones** to the 1s column, **10** + 4, equals **14 ones**. Cross out the 4 ones and write **14 ones** above.

Step 6

Next in the 1s column, **14** subtract 8, equals **6 ones** (6).
Write **6** in the total value of the 1s column.

Step 7

Then in the 10s column, **9** subtract 6, equals **3 tens** (30).
Write **3** in the total value of the 10s column.

Step 8

Lastly in the 100s column, **7** subtract 5, equals **2 hundreds** (200).
Write **2** in the total value of the 100s column.
Total value is **236**.

3- Digit Column Subtraction

Step 1

	100s	10s	1s
	8	0	4
-	5	6	8

Step 2

	100s	10s	1s
	7		
	~~8~~	0	4
-	5	6	8

Step 3

	100s	10s	1s
	7	10	
	~~8~~	~~0~~	4
-	5	6	8

Step 4

	100s	10s	1s
		9	
	7	~~10~~	
	~~8~~	~~0~~	4
-	5	6	8

Step 5

	100s	10s	1s
		9	
	7	~~10~~	14
	~~8~~	~~0~~	~~4~~
-	5	6	8

Step 6

	100s	10s	1s
		9	
	7	~~10~~	14
	~~8~~	~~0~~	~~4~~
-	5	6	8
			6

Step 7

	100s	10s	1s
		9	
	7	~~10~~	14
	~~8~~	~~0~~	~~4~~
-	5	6	8
		3	6

Step 8

	100s	10s	1s
		9	
	7	~~10~~	14
	~~8~~	~~0~~	~~4~~
-	5	6	8
	2	3	6

3- Digit Column Subtraction

Step 1

In the 1s column, 0 subtract 4, you cannot do. (Discuss why not)

Step 2

From the 10s column, you cannot regroup 1 ten from the 0 tens to the 1s column. (Discuss why not) Instead from the next place value column, the 100s, regroup 1 hundred from the 3 hundred to the 10s column. Cross out the 3 hundred and write **2 hundreds** above.

Step 3

Now in the 10s column, regroup the **1 hundred** in to **10 tens**, **10** + 0, equals **10 tens**. Cross out the 0 tens and write **10 tens** above.

Step 4

Then in the 10s column, regroup 1 ten to 10 ones to the 1s column. Cross out the **10 tens** and write **9 tens** above.

Step 5

Regroup the **1 ten** to **10 ones** to the 1s column, **10** + 0, equals. **10 ones**. Cross out the 0 ones and write **10 ones** above

Step 6

Next in the 1s column, **10** subtract 4, equals **6 ones** (6). Write **6** in the total value of the 1s column.

Step 7

Then in the 10s column, **9** subtract 9, equals **0 tens** (0). Write **0** in the total value of the 10s column.

Step 8

Lastly in the 100s column, **2** subtract nothing, equals **2 hundreds** (200). Write **2** in the total value of the 100s column.

Total value is **206**.

3- Digit Column Subtraction

Step 1

	100s	10s	1s
	3	0	0
-		9	4

Step 2

	100s	10s	1s
	~~3~~ 2	0	0
-		9	4

Step 3

	100s	10s	1s
	~~3~~ 2	~~0~~ 10	0
-		9	4

Step 4

	100s	10s	1s
	~~3~~ 2	~~0~~ 9 10	0
-		9	4

Step 5

	100s	10s	1s
	~~3~~ 2	~~0~~ 9 10	~~0~~ 10
-		9	4

Step 6

	100s	10s	1s
	~~3~~ 2	~~0~~ 9 10	~~0~~ 10
-		9	4
			6

Step 7

	100s	10s	1s
	~~3~~ 2	~~0~~ 9 10	~~0~~ 10
-		9	4
		0	6

Step 8

	100s	10s	1s
	~~3~~ 2	~~0~~ 9 10	~~0~~ 10
-		9	4
	2	0	6

Grid Method (x 1- digit)

Step 1

267 x 4 is partitioned and the value of each digit written in the grid (200 + 60 + 7) x (4).

Step 2

Multiply 7 ones by 4, equals **28** ones.

Step 3

Multiply 60 ones (6 tens) by 4, equals **240** ones (24 tens).

Step 4

Multiply 200 ones (2 hundreds) by 4, equals **800** ones (8 hundreds).

Step 5

Next using Column Addition add altogether, **28** + **240** + **800**.
Add the 1s column, **8** + **0** + **0**, equals **8** ones (8).
Write **8** in the total value of the 1s column.
Add the 10s column, **2** + **4** + **0**, equals **6** tens (60).
Write **6** in the total value of the 10s column.
Add the 100s column, **2** + **8**, equals **10** hundred (1000 + 0).
Write **0** in the total value of the 100s column.
Regroup the **10 hundred** in to **1 thousand** and write **1** in the 1000s column.
Add altogether the 1000s column and write **1** in the total value of the 1000s column.
Total value is **1068**.

Grid Method (x 1- digit)

Step 1

x	200	60	7
4			

Step 2

x	200	60	7
4			28

Step 3

x	200	60	7
4		240	28

Step 4

x	200	60	7
4	800	240	28

Step 5

	1000s	100s	10s	1s
			2	8
		2	4	0
+		8	0	0
	1			
	1	0	6	8

Ladder Method (x 1- digit)

Step 1

In the 1s column, multiply 9 by 7, equals **63** ones (60 + 3).
In the first line of working out, write **3** below the 7 in the
1s column and write **6** below the 2 in the 10s column.

Step 2

Now in the 10s column, multiply (20) 2 by 7, equals **140** ones
(14 tens). In the second line of working out, write **0** in the
1s column, write **4** in the 10s column and write **1** in the 100s column.

Step 3

Then in the 100s column, multiply (100) 1 by 7, equals **700** ones
(7 hundred). In the third line of working out, write **0** in the 1s column,
write **0** in the 10s column and write **7** in the 100s column.

Step 4

Next using Column Addition add altogether , **63** + **140** + **700**.
In the 1s column add altogether, 3 + **0** + **0**, equals **3** ones (3).
Write **3** in the total value of the 1s column.

Step 5

Then in the 10s column add altogether, **6** + **4** + **0**, equals **10** tens
(100). Write **0** in the total value of the 10s column.
Regroup the **10 tens** in to **1 hundred** and write **1** below the **7**
in the 100s column.

Step 6

Lastly in the 100s column add altogether, **1** + **7** + **1**, equals **9 hundreds**
(900). Write **9** in the total value of the 100s column.
Total value is **903**.

Ladder Method (x 1- digit)

Step 1	100s	10s	1s
	1	2	9
x			7
		6	3
+			

Step 2	100s	10s	1s
	1	2	9
x			7
		6	3
	1	4	0
+			

Step 3	100s	10s	1s
	1	2	9
x			7
		6	3
	1	4	0
+	7	0	0

Step 4	100s	10s	1s
	1	2	9
x			7
		6	3
	1	4	0
+	7	0	0
			3

Step 5	100s	10s	1s
	1	2	9
x			7
		6	3
	1	4	0
+	7	0	0
	1		
		0	3

Step 6	100s	10s	1s
	1	2	9
x			7
		6	3
	1	4	0
+	7	0	0
	1		
	9	0	3

Short Multiplication (x 1- digit)

Step 1
In the 1s column, multiply 9 by 5 , equals 45 ones (**40** + **5**).

Step 2
Write **5 ones** in the total value of the 1s column. Regroup the **40 ones** in to **4 tens** to the 10s column and write **4** in the 10s column.

Step 3
Now in the 10s column, multiply (30) 3 by 5, equals 15 tens (**100** + **50**).
Add the regrouped **4 tens** (40) below, equals 19 tens (**100** + **90**).
Write **9 tens** in the total value of the 10s column. Regroup the **10 tens** in to **1 hundred** to the 100s column and write **1** in the 100s column.

Step 4
Next in the 100s column, multiply (100) 1 by 5, equals **5** hundreds (500)
Add the regrouped **1 hundred** (100) below, equals **6** hundred (600).
Lastly write **6** in the total value of the 100s column.
Total value is **695**.

Step 1	**100s**	**10s**	**1s**
	1	3	9
x			5

Step 2	**100s**	**10s**	**1s**
	1	3	9
x			5
		4	
			5

Step 3	**100s**	**10s**	**1s**
	1	3	9
x			5
	1	**4**	
		9	**5**

Step 4	**100s**	**10s**	**1s**
	1	3	9
x			5
	1	**4**	
	6	**9**	**5**

Short Multiplication (x 1- digit)

Step 1
In the 1s column, multiply 0 by 9, equals 0 ones (**0**).

Step 2
Write **0** in the total value of the 1s column.
(There is no regrouping to add on, discuss why not).

Step 3
Now in the 10s column, multiply (30) 3 by 9, equals 27 tens (**200** + **70**). Write **7 tens** in the total value of the 10s column. Regroup the **20 tens** in to **2 hundred** to the 100s column and write **2** in the 100s column.

Step 4
Next in the 100s column, multiply (100) 1 by 9, equals **9** hundred (900). Add the regrouped **2 hundred** (200) below, equals **11** hundred (1000 + 100). Lastly write **1 hundred** in the total value of the 100s column and write **1 thousand** in the total value of the 1000s column. Total value is **695**.

Step 1	**100s**	**10s**	**1s**
	1	3	0
x			9

Step 2	**100s**	**10s**	**1s**
	1	3	0
x			9
			0

Step 3	**100s**	**10s**	**1s**
	1	3	0
x			9
	2		
		7	**0**

Step 4	**1000s**	**100s**	**10s**	**1s**
		1	3	0
x				9
		2		
	1	**1**	**7**	**0**

Grid Method (x 2- digit)

Step 1

257 x 13 is partitioned and the value of each digit written in the grid, (200 + 50 + 7) x (10 + 3). Multiply 7 ones by 3, equals **21** ones.

Step 2

Multiply 50 ones (5 tens) by 3, equals **150** ones (15 tens).

Step 3

Multiply 200 ones (2 hundreds) by 3, equals **600** ones (6 hundreds).

Step 4

Multiply 7 ones by 10, equals **70** ones.

Step 5

Multiply 50 ones (5 tens) by 10, equals **500** ones (5 hundreds).

Step 6

Multiply 200 ones (2 hundreds) by 10, equals **2000** ones (2 thousands).

Step 7

Next using Column Addition add altogether, **21** + **70** + **150** + **500** + **600** + **2000**. Add the 1s column, **1** + **0** + **0** + **0** + **0** + **0**, equals **1** one (1).
Write **1** in the total value of the 1s column.
Add the 10s column, **2** + **7** + **5** + **0** + **0** + **0**, equals 14 tens (**100** + **40**).
Write **4** in the total value of the 10s column.
Regroup the **10 tens** in to **1 hundred** and write **1** underneath the **0** in the 100s column. Add the 100s column, **1** + **5** + **6** + **0** + **1**, equals 13 hundred (**1000** + **300**). Write **3** in the total value of the 100s column.
Regroup the **10 hundred** in to **1 thousand** and write **1** underneath the **2** in the 1000s column.
Add the 1000s column, **2** + **1**, equals 3 thousands (3000).
Write **3** in the total value of the 1000s column. Total value is **3341**.

Grid Method (x 2- digit)

Step 1

x	200	50	7
10			
3			21

Step 2

x	200	50	7
10			
3		150	21

Step 3

x	200	50	7
10			
3	600	150	21

Step 4

x	200	50	7
10			70
3	600	150	21

Step 5

x	200	50	7
10		500	70
3	600	150	21

Step 6

x	200	50	7
10	2000	500	70
3	600	150	21

Step 7

	1000s	100s	10s	1s
			2	1
			7	0
		1	5	0
		5	0	0
		6	0	0
+	2	0	0	0
	1	1		
	3	3	4	1

Long Multiplication (x 2- digit)

Step 1 (First line of working out)
In the 1s column, 7 x 4, equals 28 ones (**20** + **8**).
Write **8** underneath the 4 in the 1s column.
Regroup the **20 ones** in to **2 tens** and write it as a **small 2** below the 2 in the 10s column.

Step 2
Now in the 10s column, (30) 3 x 4, equals 12 tens (**100** + **20**).
Add the regrouped **2 tens** to the 12 tens, equals 14 tens (**100** + **40**).
Write **4** underneath the 2 in the 10s column.
Regroup the **10 tens** in to **1 hundred** and write a **small 1** below the 1 in the 100s column.

Step 3
Then in the 100s column, (100) 1 x 4, equals 4 hundreds (**400**).
Add the regrouped **1 hundred** to the 4 hundreds, equals 5 hundreds (**500**). Write **5** below the 1 in the 100s column.

Step 4 (Second line of working out)
In the 1s column, write **0** below the **8** as a place holder, to represent the place value of the 10s in **2**4 the multiplier. (Discuss why)

Step 5
Now in the 1s column, 7 x 2 (20), equals 14 tens (**100** + **40**).
Write **4** below the 4 in the 10s column.
Regroup the **10 tens** in to **1 hundred**.
Write a **small 1** below the **5** in the 100s column.

Step 6
Then in the 10s column, (30) 3 x 2 (20), equals 6 hundreds (**600**).
Add the regrouped **1 hundred** to the 6 hundreds, equals 7 hundreds (**700**). Write **7** below the **5** in the 100s column.

Step 7
Next in the 100s column, (100) 1 x 2 (20), equals 2 thousands (**2000**).
Write **2** in the 1000s column.

Step 8 (Third line of working out)
Lastly add altogether the two lines of working out, excluding the **small regroup values**. Total value is **3288**.

Long Multiplication (x 2- digit)

Step 1

	100s	10s	1s
	1	3	7
x		2	4
			8 (2)
+			

Step 2

	100s	10s	1s
	1	3	7
x		2	4
		4 (2) (1)	8
+			

Step 3

	100s	10s	1s
	1	3	7
x		2	4
	5 (1)	4 (2)	8
+			

Step 4

	100s	10s	1s
	1	3	7
x		2	4
	5 (1)	4 (2)	8
+			0

Step 5

	100s	10s	1s
	1	3	7
x		2	4
	5 (1)	4 (2)	8
+	(1)	4	0

Step 6

	100s	10s	1s
	1	3	7
x		2	4
	5 (1)	4 (2)	8
+	7 (1)	4	0

Step 7

1000s	100s	10s	1s
	1	3	7
		2	4
	5 (1)	4 (2)	8
2	7 (1)	4	0

Step 8

1000s	100s	10s	1s
	1	3	7
		2	4
	5 (1)	4 (2)	8
2	7 (1)	4	0
1			
3	2	8	8

Long Division (÷ 1-digit)

Step 1

How many groups of 2 divide exactly into 1? The answer is **0.**
(Discuss why) Write **0** on the line above the 1.

Step 2

Write 0 below the 1 and draw a line underneath it. (Discuss why)
Then 1 subtract 0, equals **1**. Write the **1** below the 0.
Regroup the **1** to the next place value digit, 3, to make **1**3, by writing 3 next to the **1**.

Step 3

How many groups of 2 divide exactly into **1**3? The answer is **6** (2x**6**=12)
Write **6** on the line above the 3, next to the **0**.
Write **12** below the **1**3 and draw a line underneath the **12**.
Then **1**3 subtract **12**, equals **1**. Write **1** below the **2**.

Step 4

Regroup the remainder **1** to the next place value digit, 5,
to become **1**5, by writing 5 next to the **1**.

Step 5

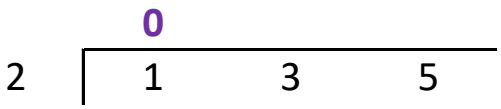
How many groups of 2 divide exactly into **1**5? The answer is **7**. (2x**7**=14)
Write **7** on the line above the 5 next to the **6**.
Write **14** below the **1**5 and draw a line underneath the **14**.

Step 6

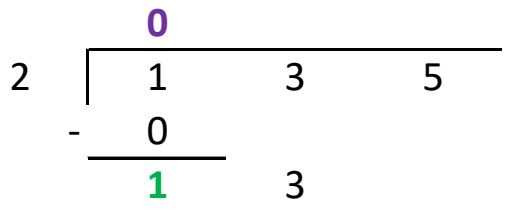
Then **1**5 subtract **14**, equals **1**. Write **1** below the **4**.
The remainder **1** cannot be regrouped to the next place value digit,
(Discuss why not). So the remainder **1**, is written as **r1** on the line above, next to the **7**. Total value is **67 r1**.

Long Division (÷ 1-digit)

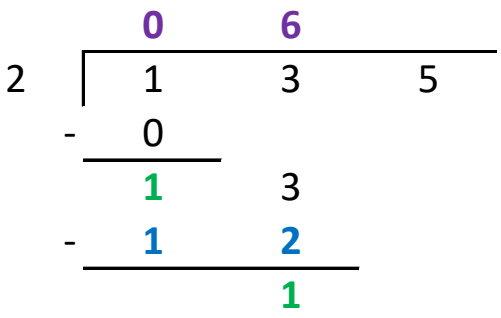
Step 1



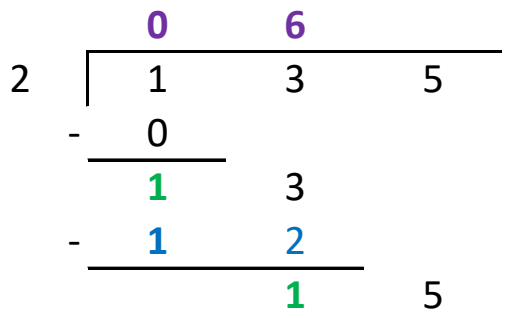
Step 2



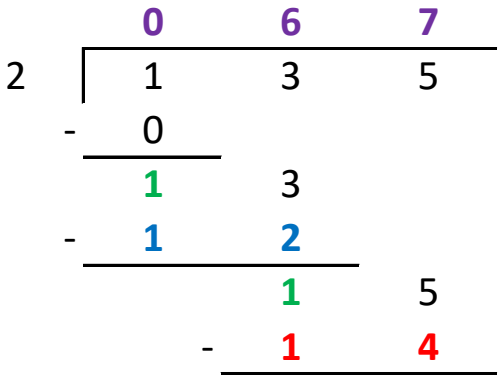
Step 3



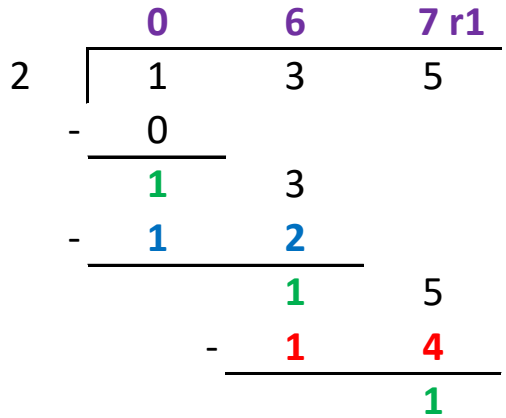
Step 4



Step 5



Step 6



Long Division (÷ 2-digit)

Step 1

How many groups of 12 divide exactly into 1?
The answer is **0** (Discuss why).
Write **0** on the line above the 1.
Write 0 below the 1 and draw a line underneath it.
Then 1 subtract 0, equals **1**. Write the **1** below the 0. Regroup the **1** to the next place value digit 3, to make **1**3 , by writing 3 next to the **1**.

Step 2

How many groups of 12 divide exactly into **1**3?
The answer is **1** (12 x **1** =12).
Write **1** on the line above the 3, next to the **0**.
Write **12** below the **1**3 and draw a line underneath the **12**.
Then **1**3 subtract **12**, equals **1**. Write **1** below the **2**.

Step 3

Regroup the remainder **1** to the next place value digit, 5,
to become **1**5, by writing 5 next to the **1**.

Step 4

How many groups of 12 divide exactly into **1**5?
The answer is **1** (12 x **1** =12).
Write **12** below the **1**5 and draw a line underneath the **12**.

Step 5

Then **1**5 subtract **12**, equals **3**. Write **3** below the **2**.
The remainder **3** cannot be regrouped to another place value digit, (Discuss why not). So the remainder **3**, is written as **r3** on the total value line above.
Total value is **11 r3**.

Long Division (÷ 2-digit)

Step 1

```
      0
12 | 1  3  5
   - 0
     1  3
```

Step 2

```
      0  1
12 | 1  3  5
   - 0
     1  3
   - 1  2
        1
```

Step 3

```
      0  1
12 | 1  3  5
   - 0
     1  3
   - 1  2
        1  5
```

Step 4

```
      0  1  1
12 | 1  3  5
   - 0
     1  3
   - 1  2
        1  5
     - 1  2
```

Step 5

```
      0  1  1   r 3
12 | 1  3  5
   - 0
     1  3
   - 1  2
        1  5
     - 1  2
           3
```

Short Division (÷ 1-digit)

Step 1

How many groups of 2 divide exactly in to 1?
The answer is **0** (Discuss why).
Write **0** on the line above the 1.

Step 2

Cross out the 1 and regroup the remainder **1** to the next place value digit, 3, to become **1**3.

Step 3

How many groups of 2 divide exactly in to **1**3? The answer is **6** (2x**6**=12) with remainder **1** . Write **6** on the line above the **1**3.

Step 4

Regroup the remainder **1** to the next place value digit, 5, to become 15

Step 5

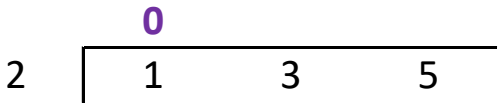
How many groups of 2 divide exactly in to **1**5? The answer is **7** (2x**7**=14) with remainder **1**. Write **7** on the line above the **1**5.

Step 6

There are no more place value digits to be divided by 2. So the remainder **1**, is written as **r1** on the line above.
Total value is **67 r1**.

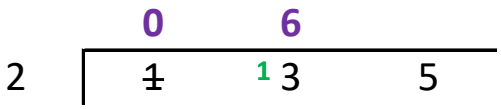
Short Division (÷ 1-digit)

Step 1

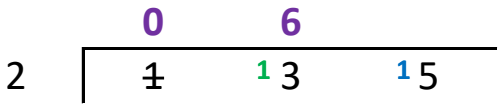


Step 2

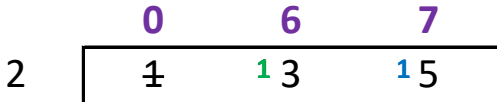
Step 3



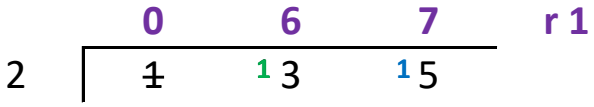
Step 4



Step 5



Step 6



Short Division (÷ 2-digit)

Step 1
How many groups of 12 divide exactly in to 1?
The answer is **0** (Discuss why).
Write **0** on the line above the 1.

Step 2
Cross out the 1 and regroup the remainder **1** to the next place value digit, 3, to become **1**3.

Step 3
How many groups of 12 divide exactly in to **1**3?
The answer is **1** (12x**1**=12), with remainder **1**.
Write **1** on the line above the **1**3.

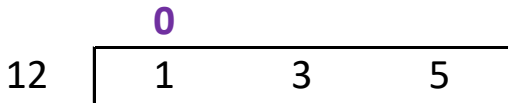
Step 4
Regroup the remainder **1** to the next place value digit, 5, to become **1**5.

Step 5
How many groups of 12 divide exactly in to **1**5?
The answer is **1** (12x**1**=12), with remainder **3**.
Write **1** on the line above the **1**5.

Step 6
There are no more place value digits to be divided by 12.
So the remainder **3**, is written as **r3** on the line above.
Total value is **11 r3**.

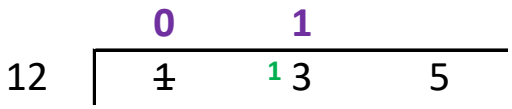
Short Division (÷ 2-digit)

Step 1

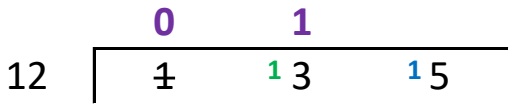


Step 2

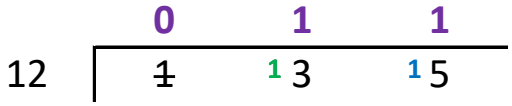
Step 3



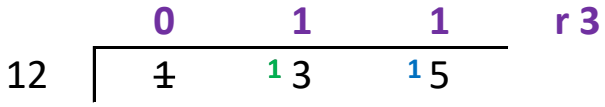
Step 4



Step 5



Step 6



Glossary

Column is a vertical arrangement for example, in a table the cells arranged vertically.

Concrete Objects are objects that can be handled and manipulated to support understanding of the structure of a mathematical concept. Materials such as Dienes(Base 10 materials), Cuisenaire, Numicon, pattern blocks are all examples of concrete objects.

Digit is one of the symbols of a number system most commonly the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. Examples: the number 29 is a 2-digit number; there are three digits in 2.95. The position or place of a digit in a number conveys its value.

Divisor is the number by which another is divided. e.g. In the calculation 30 ÷ 6 = 5, the divisor is 6. In this example, 30 is the dividend and 5 is the quotient.

Efficient Methods A means of calculation (which can be mental or written) that achieves a correct answer with as few steps as possible. In written calculations this often involves setting out calculations in a columnar layout. If a calculator is used the most efficient method uses as few key entries as possible.

Equals is the symbol: =, read as 'is equal to' or 'equals'. and meaning 'having the same value as'. e.g. 7 – 2 = 4 + 1 since both expressions, 7 – 2 and 4 + 1 have the same value, 5.

Expanded Form is a way to break up a number to show the value of each digit (Partition).

Glossary

Formal Written Method is the way of setting out working in columnar form. In addition and subtraction, the formal written methods can be referred to as expanded and column addition and/or subtraction. In multiplication, the formal written methods are called short or long multiplication depending on the size of the numbers involved. Similarly in division the formal written methods are called short or long division.

Grid a lattice created with two sets of parallel lines. Lines in each set are usually equally spaced. If the sets of lines are at right angles and lines in both sets are equally spaced, a square grid is created.

Hundred Square is a 10 by 10 square grid numbered 1 to 100. A similar grid could be numbered as a 0 – 99 grid.

Operations that, when they are combined, leave the entity on which they operate unchanged. Examples: addition and subtraction are inverse operations e.g. 5 + 6 – 6 = 5. Multiplication and division are inverse operations e.g. 6 × 10 ÷ 10 = 6.

Inverse is the opposite or reverse operation.

Mental Calculations refer to calculations that are largely carried out mentally, but may be supported with a few simple written jottings.

Multiple is the result of multiplying a number by an integer, for example, 12 is a multiple of 3 because3 × 4 = 12.

Multiplicand is a number to be multiplied by another. e.g. in 6 × 4, 4 is the multiplier as it is how many lots/groups of 6.

Glossary

Multiplier is a number to be multiplied by another. e.g. in 5 × 3, 5 is the multiplicand as it is the number to be multiplied by 3.

Number Sentence is a mathematical sentence involving numbers.
E.g. 3 + 6 = 9 and 9 > 3

Partition 1) To separate a set into subsets. 2) To split a number into component parts. e.g. the two-digit number 38 can be partitioned into 30 + 8 or 19 + 19. 3) A model of division. e.g. 21 ÷ 7 is treated as 'how many sevens in 21?'

Pictorial Representations do enable learners to use pictures and images to represent the structure of a mathematical concept. The pictorial representation may build on the familiarity with concrete objects. E.g. a square to represent a Dienes 'flat' (representation of the number 100). Pupils may interpret pictorial representations provided to them or create a pictorial representation themselves to help solve a mathematical problem.

Place Holder In decimal notation, the zero numeral is used as a place holder to denote the absence of a power of 10.

Place Value Column is the value of a digit that relates to its position or place in a number within a column.

Place Value is the value of a digit that relates to its position or place in a number. e.g. in 1482 the digits represent 1 thousand, 4 hundred, 8 tens and 2 ones respectively; in 12.34 the digits represent 1 ten, 2 ones, 3 tenths and 4 hundredths respectively.

Glossary

Product is the result of multiplying one number by another. e.g. The product of 2 and 3 is 6 since 2 × 3 = 6.

Quotient is the result of a division. e.g. 46 ÷ 3 = 15⅓ and 15⅓ is the quotient of 46 by 3. Where the operation of division is applied to the set of integers, and the result expressed in integers, for example 46 ÷ 3 = 15 remainder 1 then 15 is the quotient of 46 by 3 and 1 is the remainder.

Regrouping is to change a number for another of equal value. The process of regrouping is used in some standard compact methods of calculation. e.g.: 'carrying figures/exchanging' in addition, multiplication or division; and 'decomposition' in subtraction.

Remainder in the context of division requiring a whole number answer (quotient), the amount remaining after the operation. e.g. 29 divided by 7 = 4 remainder 1.

Step Counting is the process of repeatedly adding the same number or amount. One model for multiplication. e.g. 5 + 10 + 15 + 20 = 5 x 4.

Total Value is the sum to a calculation.

Zero in a place value system, a place-holder. e.g. 105

A Maths Resource for Primary Schools

An easy to follow Step-by-Step Guide to The Four Operations.

Aims to develop accuracy, fluency and improve understanding of the formal written methods.

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