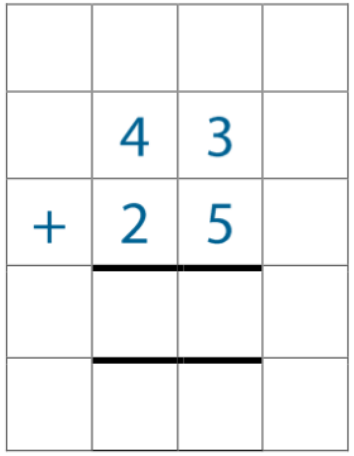
Calculation Methods at Key Stage 2

Addition, Subtraction, Multiplication and Division

Addition

Adding in KS2

- There are many representations the children will see before they are ready for addition that looks like this:



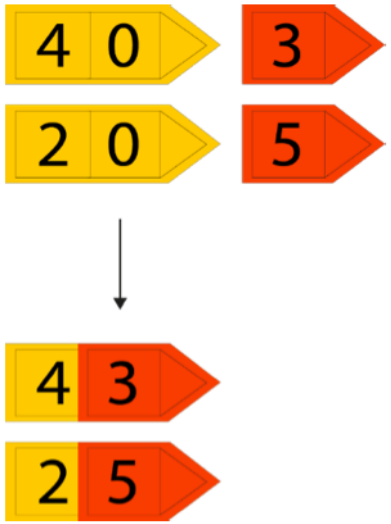
Addend plus addend is equal to the sum

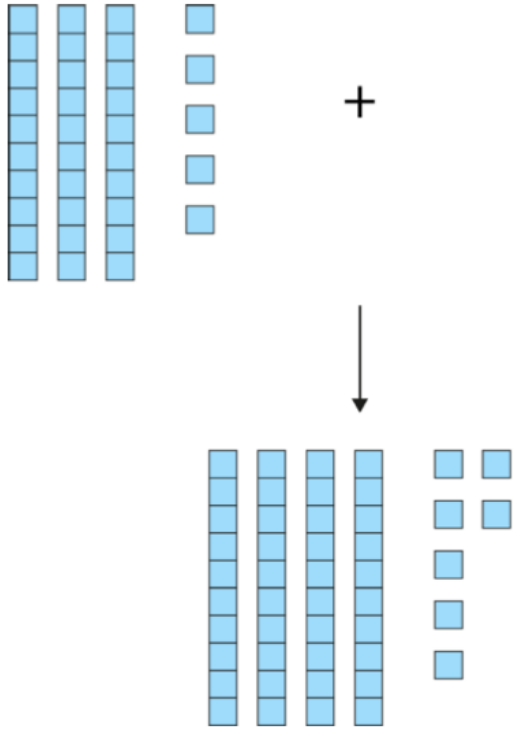
Addition

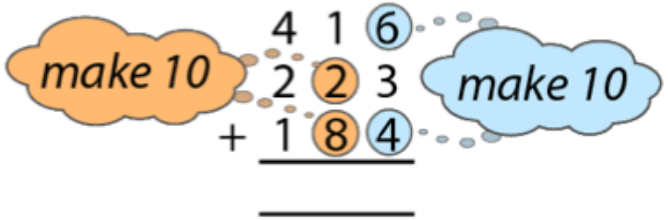
We use the correct vocabulary

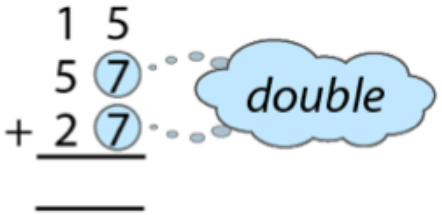
- Addend 26 + 45 = 71
- Sum 26 + 45 = 71

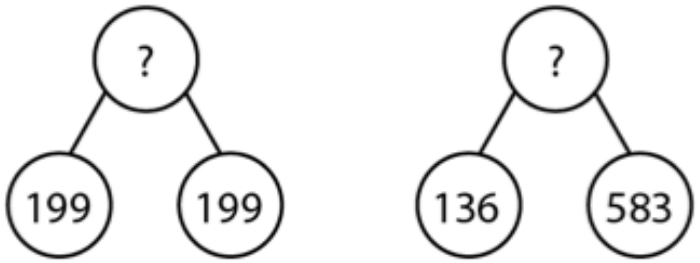
Adding in KS2







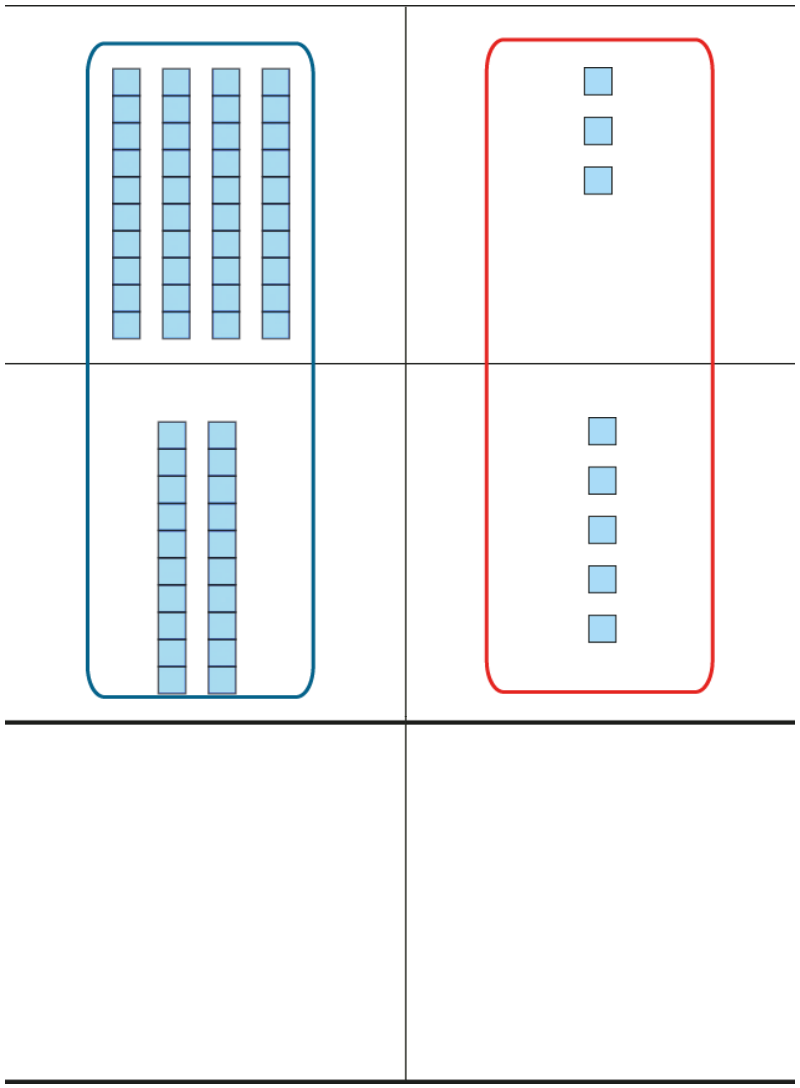




	4	3	
+	2	5	

$$\begin{array}{r} 124 \\ +\ 233 \\ \hline \end{array} \qquad \begin{array}{r} 644 \\ +\ 172 \\ \hline \end{array} \qquad \begin{array}{r} 366 \\ +\ 277 \\ \hline \end{array}$$

$$\begin{array}{r} 579 \\ +\ 221 \\ \hline \end{array} \qquad \begin{array}{r} 791 \\ +\ 163 \\ \hline \end{array} \qquad \begin{array}{r} 567 \\ +\ 233 \\ \hline \end{array}$$

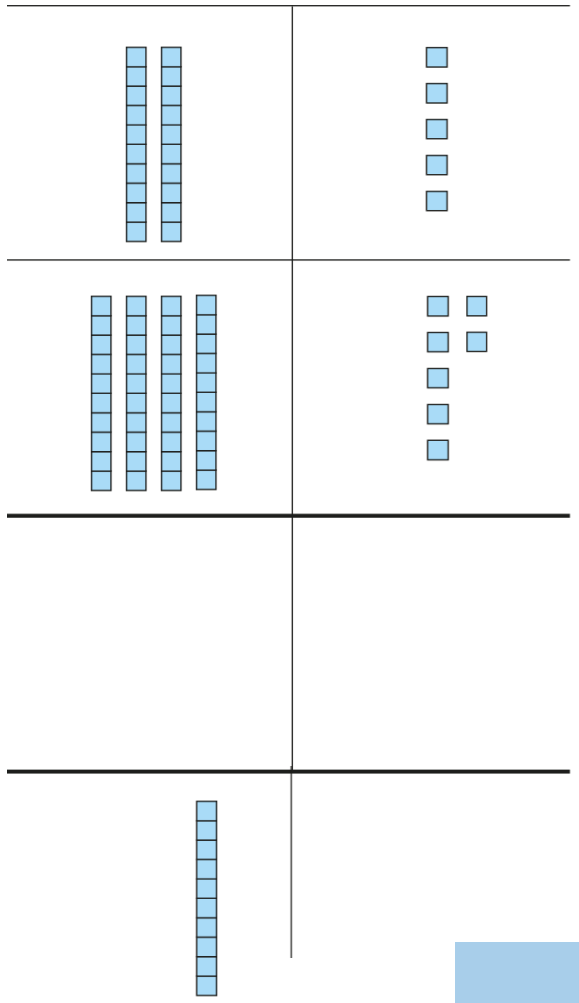


$$\begin{array}{r} 4\ \ 3 \\ +\ 2\ \ 5 \\ \hline \\ \hline \end{array}$$

- Write the two numbers as shown ready for column addition.
- Is it important that the 5 ones is written underneath the 3 ones?
- We add like values together, so tens with tens and ones with ones.
- What does the digit 3 represent?
- What does the digit 2 represent?
- In column addition, we start at the right-hand side.

We add the ones.3 ones plus 5 ones is equal to 8 ones.
We add the tens. 4 tens plus 2 tens is equal to 6 tens.

Regrouping



$$\begin{array}{r} 2\ 5 \\ +\ 4\ 7 \\ \hline 7\ 2 \\ \hline 1 \end{array}$$

12

- What numbers are represented by the Dienes?
- First we need to add the ones.
- Can you see where this total of twelve is on each of the representations shown?

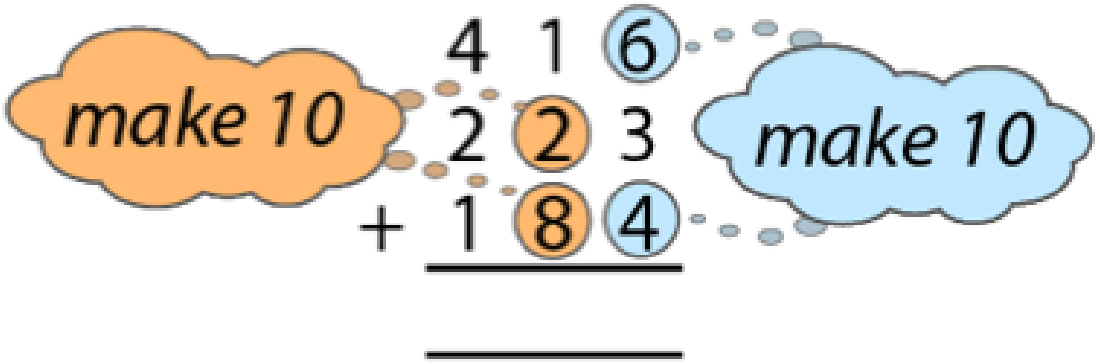
5 ones plus 7 ones is equal to 12 ones. I can regroup 12 ones. 12 ones is equal to 1 ten and 2 ones.

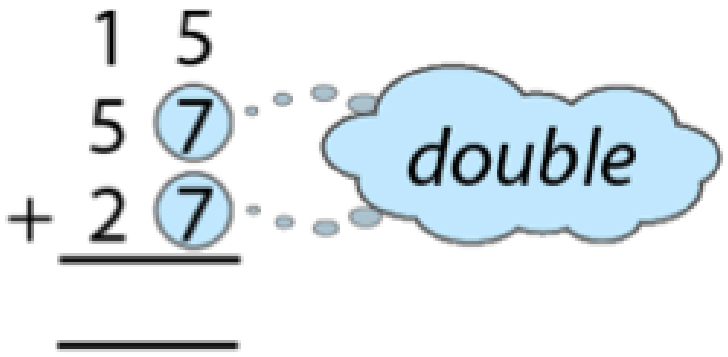
- Then we add the tens.

2 tens plus 4 tens is 6 tens. We also need to add 1 ten from the regrouping. There are 7 tens altogether.

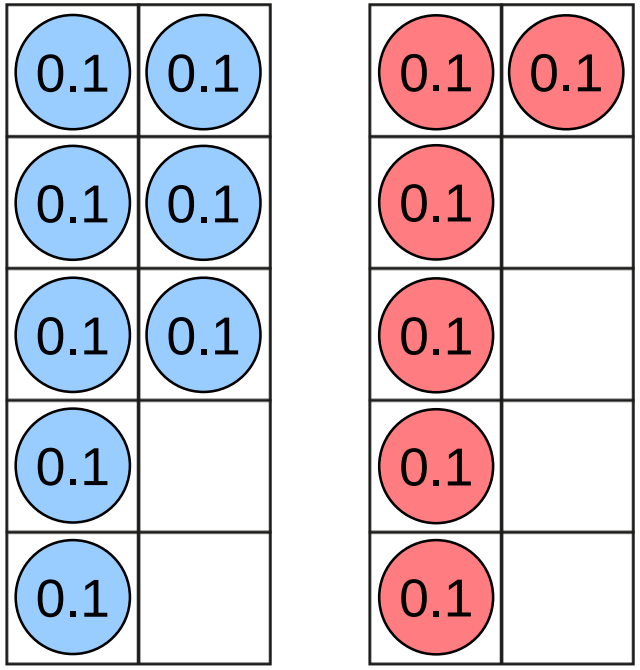
If a column group is equal to ten or more we must regroup.
10 ones is equivalent to 1 ten. 10 tens is equivalent to 1 hundred.

Making Connections





Making Connections



8 + 6

8 tenths + 6 tenths

0.8 + 0.6

- What do you notice?
- What is the same about the two calculations? What is different?
- How can we use 8 + 6 to help us find 0.8 + 0.6?
- How else can we say 14 tenths?

8 + 6 = 14

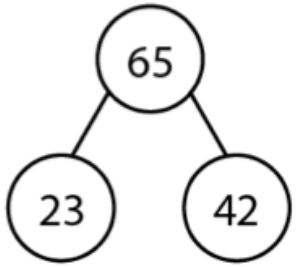
8 tenths + 6 tenths = 14 tenths

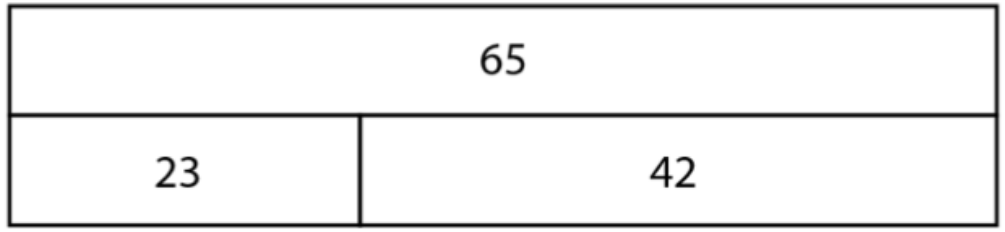
14 tenths = 1 one + 4 tenths

Subtraction

Subtraction in KS2

- The representations used for subtraction are ones that the children are familiar with from their prior learning in addition.





The minuend minus the subtrahend is equal to the difference

Subtraction

We use the correct vocabulary

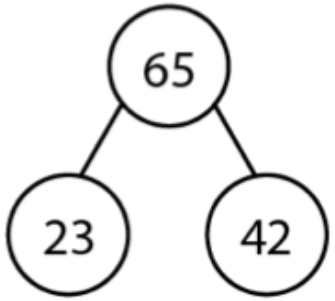
- Minuend 71 - 26 = 45
- Subtrahend 71 - 26 = 45
- Difference 71 - 26 = 45

Subtraction in KS2

$$65 - 23 = 65 - 20 - 3$$
$$= 45 - 3$$
$$= 42$$

$65 - 23 = 42$

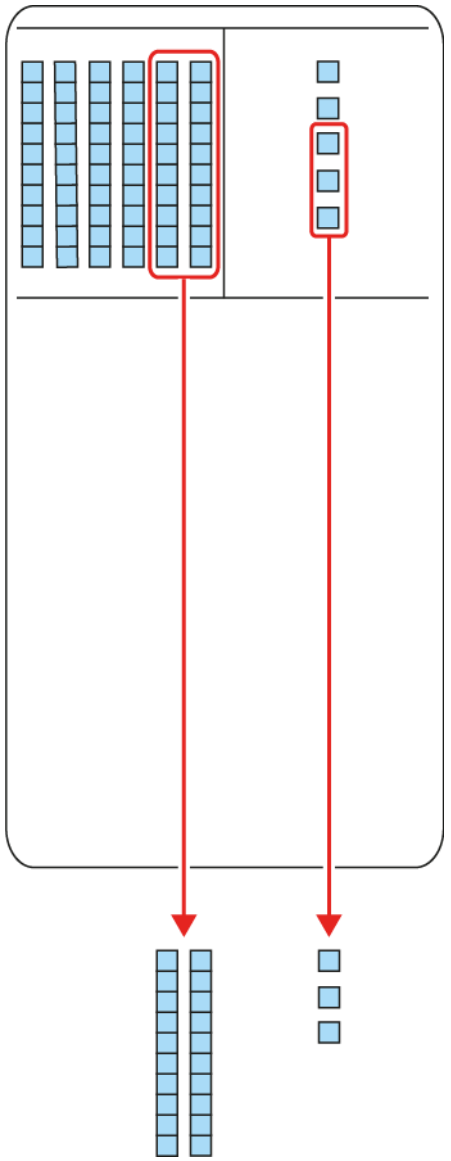
$$\begin{array}{rr} & 6\ 5 \\ - & 2\ 3 \\ \hline & 4\ 2 \\ \hline \end{array}$$



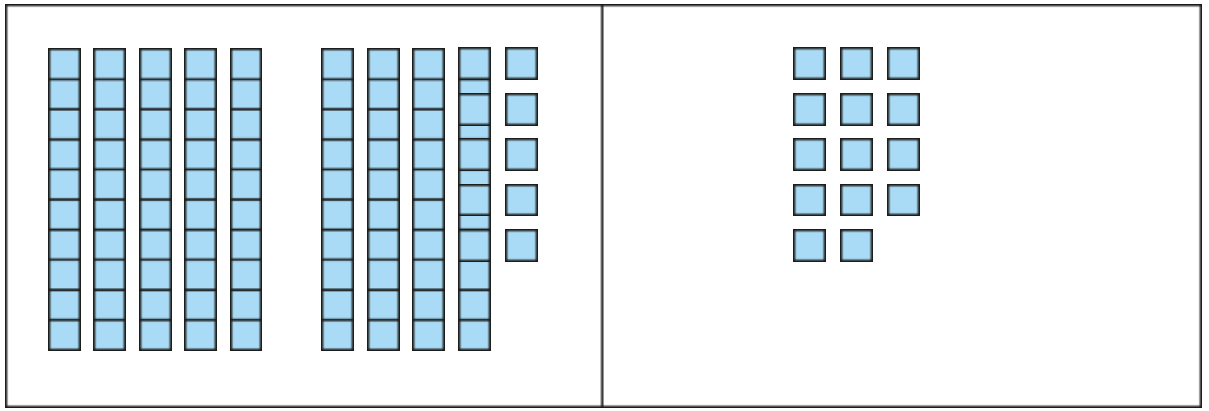
65	
23	42

Subtraction

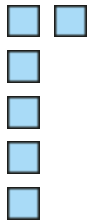
	10s	1s
	6	5
−	2	3
	4	2



Exchanging

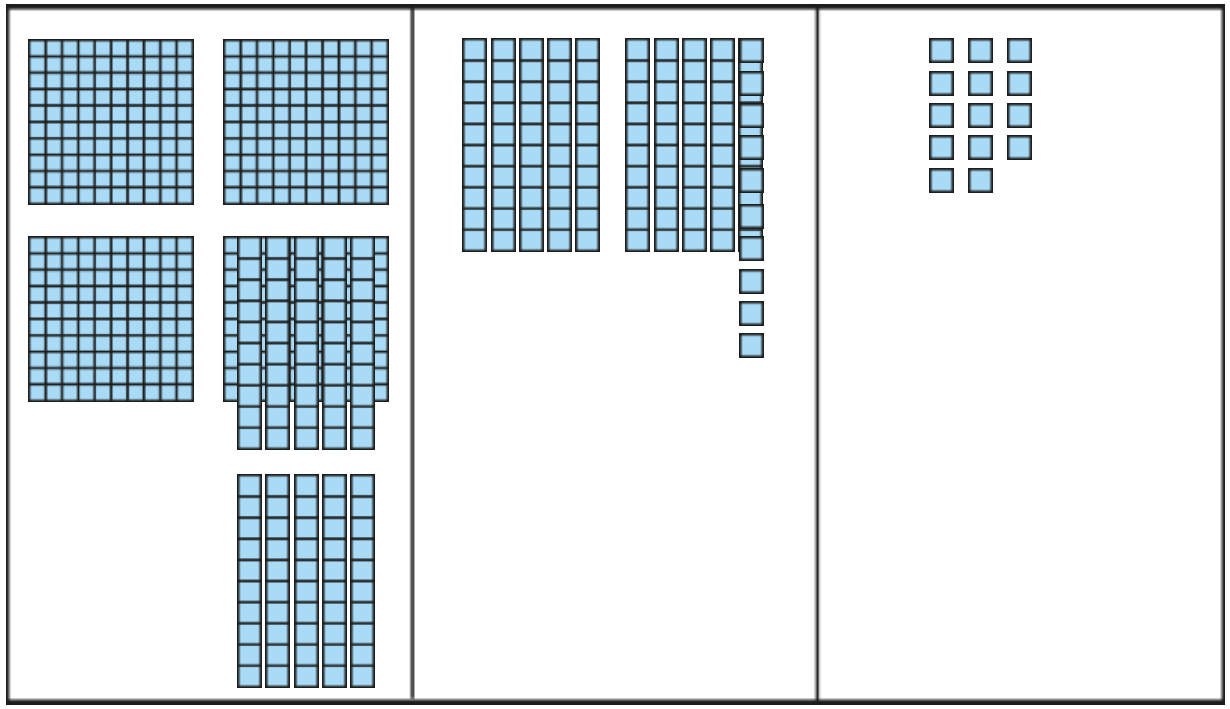


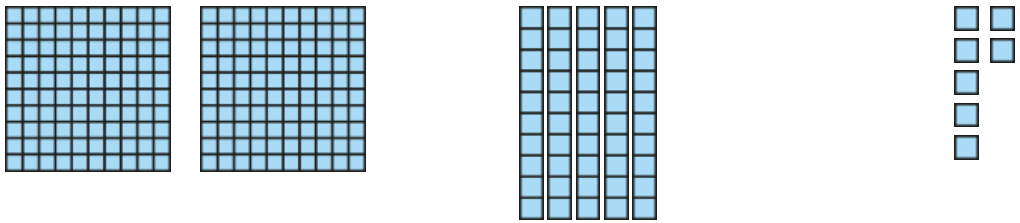
94 – 6 = 88



	10s	1s
	~~9~~ 8	1 4
–		6
	8	8

Exchanging





	100s	10s	1s
	~~4~~ 3	~~1~~ 0 9	1 4
−	2	5	7
	1	4	7

Making Connections

'The game I want to buy costs £29.50. I have saved £18.94. How much more do I need to save before I can buy the game?'

$$\begin{array}{rr} & £\ 2\ \cancel{9}^{8}\ .\ \cancel{5}^{\,1}{}^{4}\ 0 \\ - & £\ 1\ 8\ .\ 9\ 4 \\ \hline & £\ 1\ 0\ .\ 5\ 6 \end{array}$$

'I buy two magazines. One costs £1.37 and the other costs £2.45. How much do I spend altogether?'

?	
£1.37	£2.45

$$\begin{array}{rr} & £\ 1\ .\ 3\ 7 \\ + & £\ 2\ .\ 4\ 5 \\ \hline & £\ 3\ .\ 8\ 2 \\ \hline & \quad\ \ 1 \end{array}$$

Multiplication

Multiplication

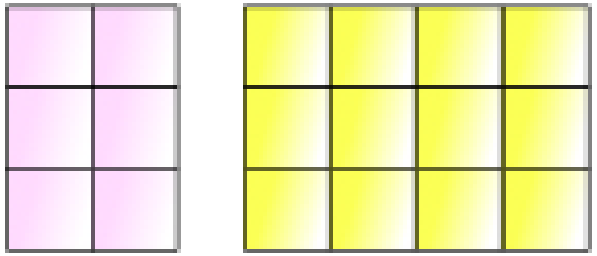
We use the correct vocabulary

- Product 9 x 5=45
- Factors 9 x 5 = 45

Distributive Law

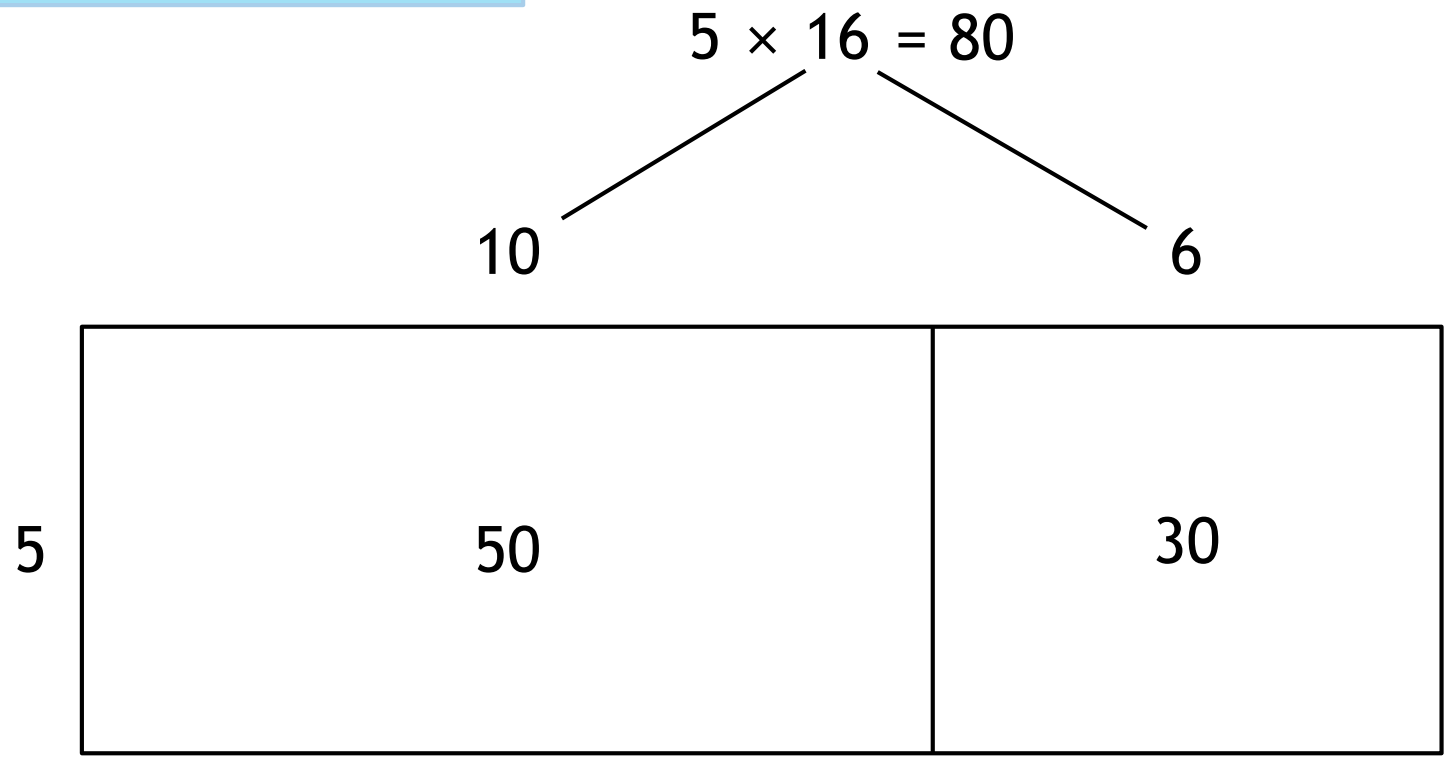
The Distributive Law says multiplying a number is the same as multiplying its addends by the number, then adding the products.

$3 \times 6 =$



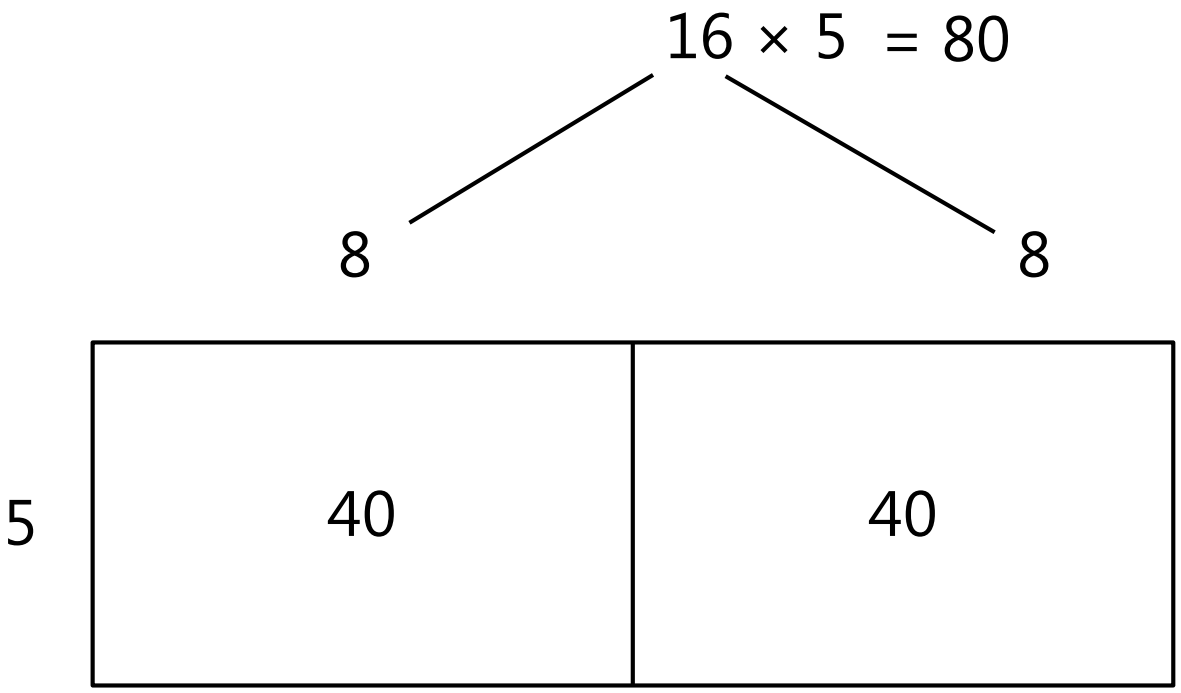
$3 \times 2 + 3 \times 4$

Distributive Law



$$5 \times 16 = 5 \times 10 + 5 \times 6$$
$$= 50 + 30$$
$$= 80$$

Distributive Law

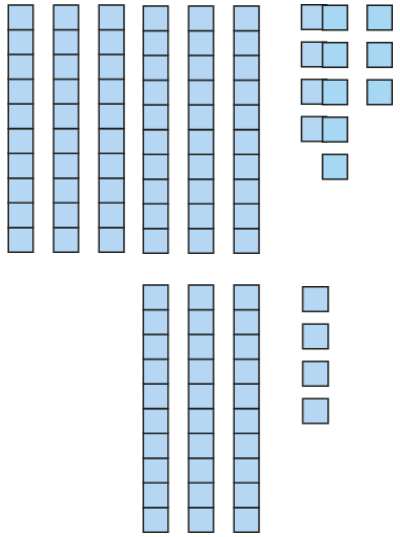


$$16 \times 5 = 8 \times 5 + 8 \times 5$$
$$= 40 + 40$$
$$= 80$$

- How else could we partition 16 without thinking of 10 and a bit?
- Could we use doubles?

Distributive Law

2 rows, each with 34 chairs. How many chairs altogether?



$$34 \times 2 = 30 \times 2 + 4 \times 2$$
$$= 60 + 8$$
$$= 68$$

Informal written method:

$34 \times 2 = 30 \times 2 + 4 \times 2$

$= \quad 60 \quad + \quad 8$

$= 68$

Expanded multiplication algorithm:

	10s	1s	
	3	4	
×		2	
		8	2 × 4 ones = 8 ones
	6	0	2 × 3 tens = 6 tens
	6	8	

$3 \times 32 = \boxed{96}$

	10s	1s
	3	2
×		3
	9	6

3 × 2 ones = 6 ones

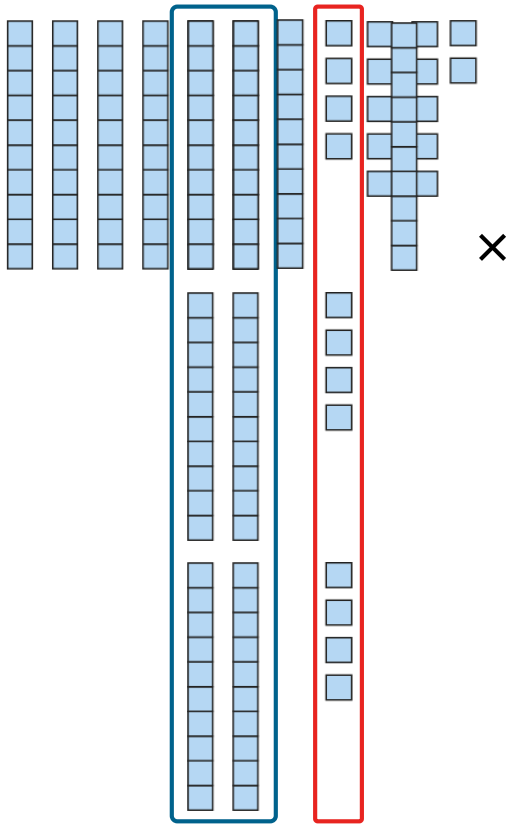
Write “6” in the ones column.

3 × 3 tens = 9 tens

Write “9” in the tens column.

Short Multiplication

3 rows, each with 24 chairs. How many chairs altogether?



	10s	1s
	2	4
×		3
	1	2
	6	0
	7	2

3 × 4 ones = 12 ones
= 1 ten + 2 ones
3 × 2 tens = 6 tens

Short Multiplication

	10s	1s
	2	4
×		3
	7	2
	1	

3 × 4 ones = 12 ones

12 ones = 1 ten 2 ones

3 × 2 tens = 6 tens

6 tens + 1 ten = 7 tens

Write “7” in the tens column and “2” in the ones column.

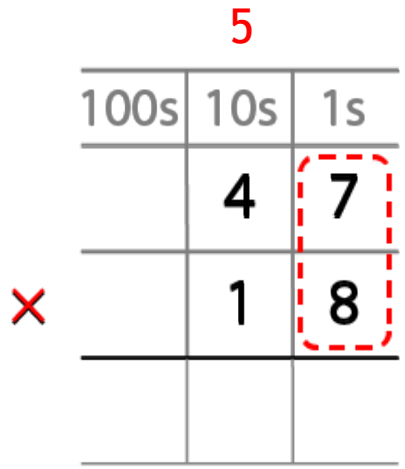
Long Multiplication

Step 1 – write the factors

	100s	10s	1s
		4	7
×		1	8

Long Multiplication

Step 2 – multiply the 1s digit by the 1s digit and regroup

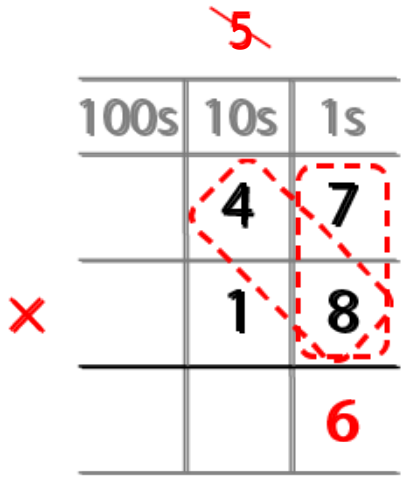


8×7 ones $= 56$ ones

$= 5$ tens $+ 6$ ones

Long Multiplication

Step 3 – multiply the 10s digit by the 1s digit, adding the regrouped 10s and regroup again



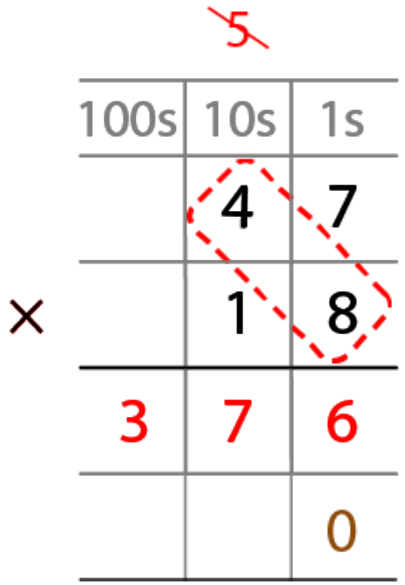
8×4 tens $= 32$ tens

32 tens $+ 5$ tens $= 37$ tens

$= 3$ hundreds $+ 7$ tens

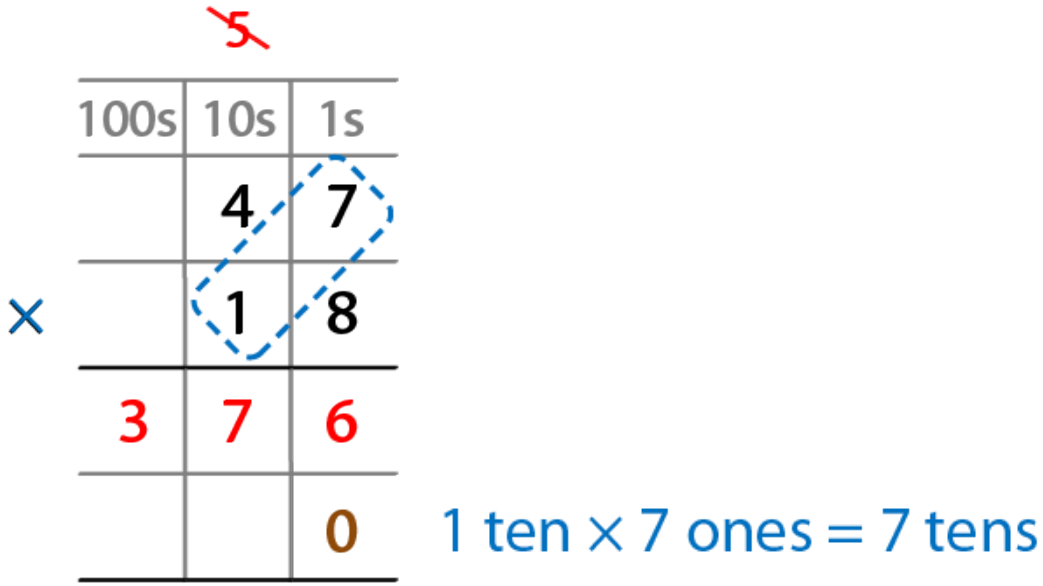
Long Multiplication

Step 4 – place a 0 to show that it's 10 times the size



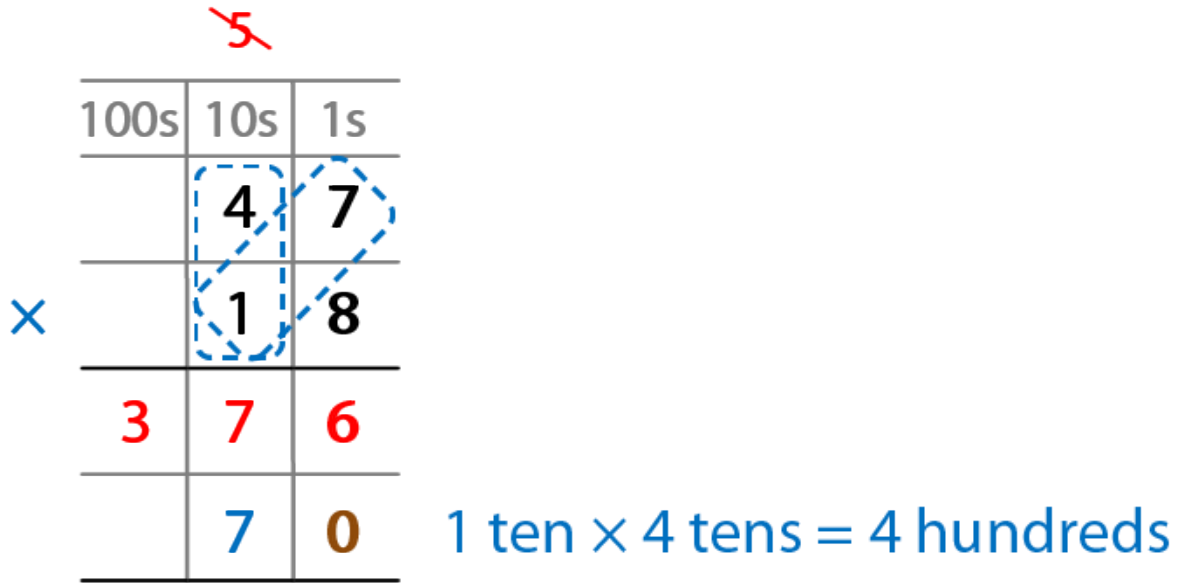
Long Multiplication

Step 5 – multiply the 1s digit by the 10s digit



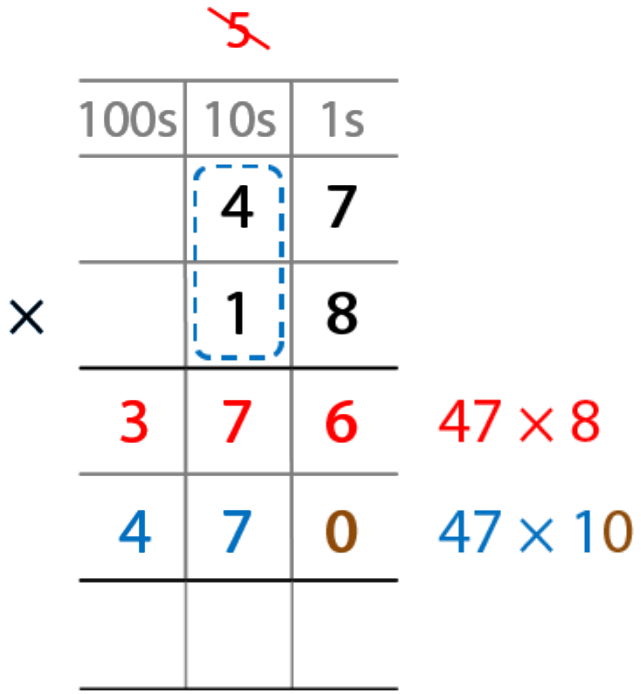
Long Multiplication

Step 6 – multiply the 10s digit by the 10s digit



Long Multiplication

Step 7 – add the partial products



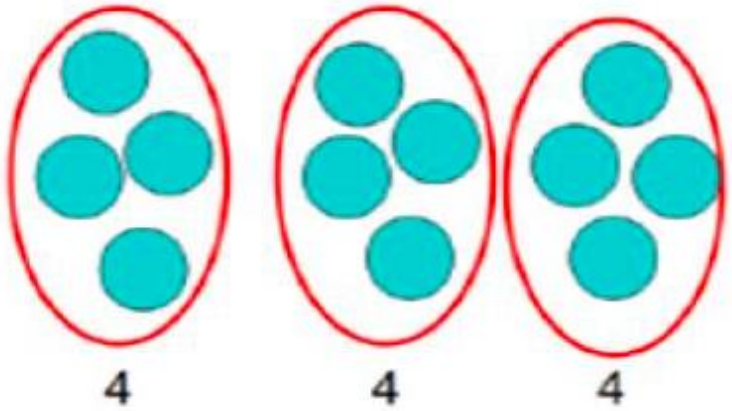
Division

Grouping and Sharing

- In KS2, we move on from grouping and sharing

How many groups of 4 can be made with 12 stars?

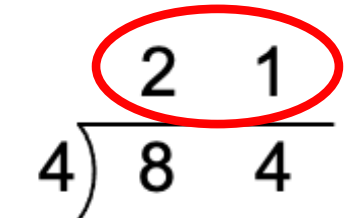
12 shared between 3 is 4.

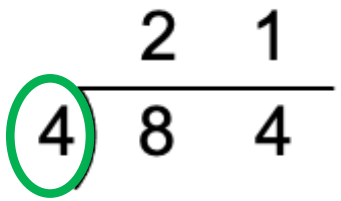


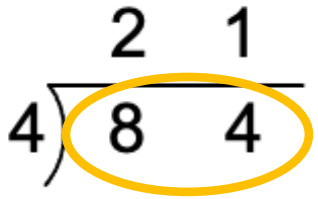
Division

We use the correct vocabulary

- Groups
- Quotient
- Divisor
- Dividend







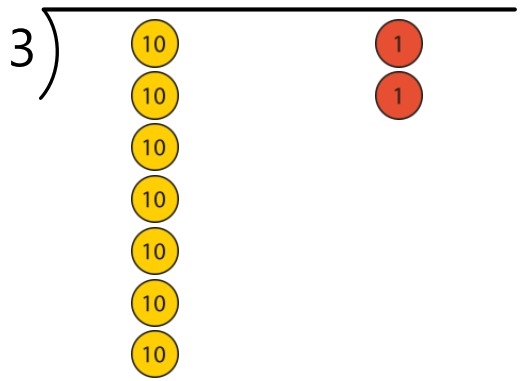
Short Division

72 sticks shared equally between 3 children. How many sticks each?

$$72 \div 3 = \square$$

Step 1 – write the divisor and the dividend:

$$3\overline{)\,7\quad 2}$$



Short Division

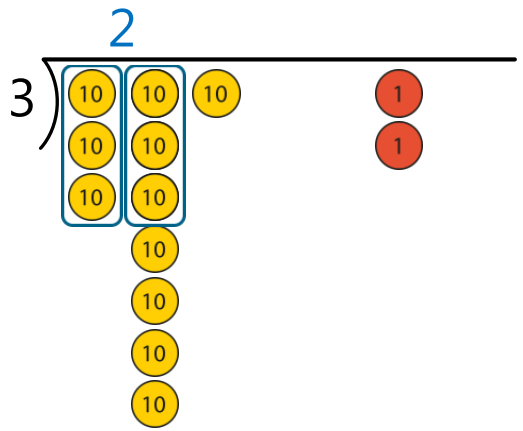
72 sticks shared equally between 3 children. How many sticks each?

$$72 \div 3 = \square$$

Step 1 – write the dividend:

Step 2 – divide the tens

$$3\overline{)\,7\quad 2}$$



7 tens ÷ 3 = 2 tens r 1 ten

Short Division

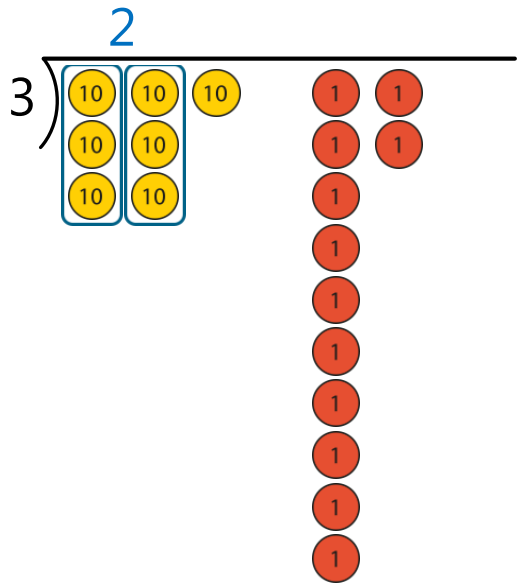
72 sticks shared equally between 3 children. How many sticks each?

$$72 \div 3 = \square$$

Step 1 – share the 10s:

Step 2 – exchange:

$$\begin{array}{r} 2 \\ 3\overline{)\,7\;\;{}^{1}2} \end{array}$$



7 tens ÷ 3 = 2 tens r 1 ten

Short Division

72 sticks shared equally between 3 children. How many sticks each?

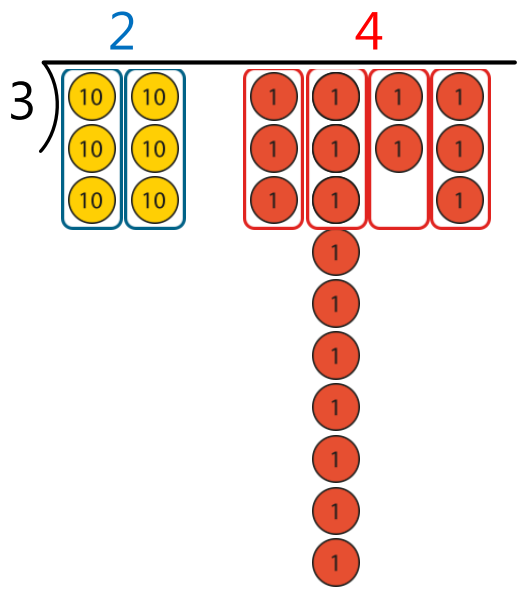
$$72 \div 3 = \boxed{24}$$

Step 1: exchange 1 ten for 10 ones

Step 2: share the tens

Step 3 – share the ones

$$\begin{array}{r} 2\ 4 \\ 3\overline{)\ 7\ {}^{1}2} \end{array}$$



7 tens ÷ 3 = 2 tens r 1 ten

12 ones ÷ 3 = 4 ones

Long Division

Step 1 – write the divisor, frame and dividend

	× 31
1	31
2	62
3	93
4	124
5	155
6	186
7	217
8	248
9	279
10	310

$$31\overline{)4\quad 3\quad 4}$$

Long Division

Step 1 – write the divisor and dividend

Step 2 – divide, then 100s

	× 31
1	31
2	62
3	93
4	124
5	155
6	186
7	217
8	248
9	279
10	310

$$31\overline{)4\quad 3\quad 4}$$

Long Division

Step 2: change the 100s to 10s,
combine with the existing 10s and divide…

Step 3: exchange the 10s for 1s

	× 31
1	31
2	62
3	93
4	124
5	155
6	186
7	217
8	248
9	279
10	310

$$31\overline{)4\ \ 3\ \ 4}\qquad 0$$

1 ten × 31 = 31 tens

Long Division

Step 1: exchange 1 ten for 10 ones,

Step 2: subtract,

Step 3: bring down the ones remainder

combine with the existing 10s and divide…

	× 31
1	31
2	62
3	93
4	124
5	155
6	186
7	217
8	248
9	279
10	310

$$
\begin{array}{r}
0\ 1 \\
31\overline{)\,4\ 3\ 4} \\
3\ 1 \\
\hline
1\ 2
\end{array}
$$

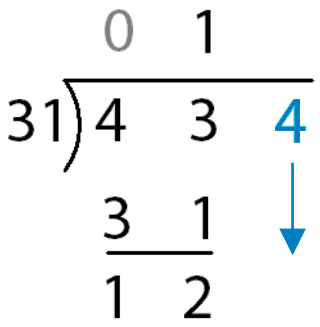
1 ten × 31 = 31 tens

Long Division

Step 4 – exchanging 1 ten for 10 ones and combine with the existing 1s

Step 5 – subtracting to find the remainder

	× 31
1	31
2	62
3	93
4	124
5	155
6	186
7	217
8	248
9	279
10	310



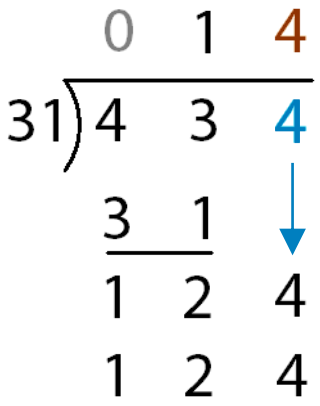
1 ten × 31 = 31 tens

Long Division

Step 5: exchange 1 ten for 10 ones and combine with the existing 1s

Step 6: divide the ones

	× 31
1	31
2	62
3	93
4	124
5	155
6	186
7	217
8	248
9	279
10	310



1 ten × 31 = 31 tens

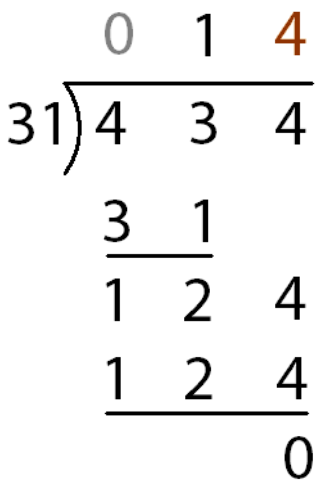
4 ones × 31 = 124 ones

Long Division

Step 7 – subtract to show there is no remainder

Step 6 – divide the ones

	× 31
1	31
2	62
3	93
4	124
5	155
6	186
7	217
8	248
9	279
10	310



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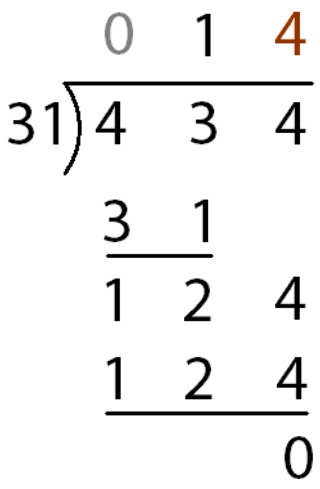

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